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Subject scope of *STAR*, *IAA*, and *On-Going Research Projects* includes all aspects of aeronautics and space research and development, supporting basic and applied research, and applications. Aerospace aspects of earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority are also covered.

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AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

Each major division is further divided into as many as nine specific categories, which are identified by category numbers.

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For related information see also *34 Fluid Mechanics and Heat Transfer*.

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Includes aircraft simulation technology.

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07 AIRCRAFT PROPULSION AND POWER 1378

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Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

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18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE N.A.

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Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.
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For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) N.A.
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT 1499
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 1500
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software*.

83 ECONOMICS AND COST ANALYSIS 1501
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 1501
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 1501
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences*.

88 SPACE SCIENCES (GENERAL) 1504

89 ASTRONOMY 1505
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 1505
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 1506
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

92 SOLAR PHYSICS 1506
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION N.A.
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

GENERAL

99 GENERAL 1507

Note: N.A. means that no abstracts were assigned to this category for this issue.

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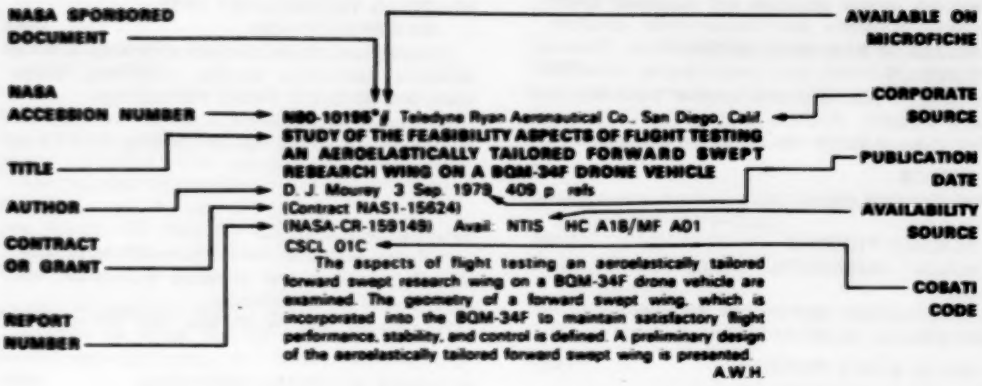
TYPICAL CITATION AND ABSTRACT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N80-10196*# Teledyne Ryan Aeronautical Co., San Diego, Calif.
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TITLE
STUDY OF THE FEASIBILITY ASPECTS OF FLIGHT TESTING AN AEROELASTICALLY TAILORED FORWARD SWEPT RESEARCH WING ON A BQM-34F DRONE VEHICLE
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D. J. Mourey 3 Sep. 1979 409 p refs
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The aspects of flight testing an aeroelastically tailored forward swept research wing on a BQM-34F drone vehicle are examined. The geometry of a forward swept wing, which is incorporated into the BQM-34F to maintain satisfactory flight performance, stability, and control is defined. A preliminary design of the aeroelastically tailored forward swept wing is presented.
A.W.H.

ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, AIRCRAFT EMERGENCY POWER SUPPLY
J.N. Foutz, U.S. Dept. of Defense, Navy, Naval Ocean Systems Center, Electronics Engineering & Sciences Dept., *San Diego, California* 92152 (DN988515)

Develop the criteria for a lightweight bi-directional power flow switching regulator power supply which can operate between a low voltage battery (emergency energy source) and the 27.0 volt dc generator bus. Bus power shall be converted to maintain the battery at optimum charge. Upon failure of the main generator the unit shall convert battery voltage to 27.0 volt dc to maintain bus power continuity.

Develop optimized topology and performance goals for a bi-directional switching regulator power supply that will service a low voltage battery and a 27.0 volt topology in the design of an emergency power supply.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

1.0002, V/STOL AERODYNAMICS
L.V. Schmidt, U.S. Dept. of Defense, Navy, Naval Postgraduate School, *Monterey, California* 93940 (DN998077)

Model the V/STOL jet reaction flow field including the presence of the aircraft shape, ground effect, cross winds and multiple jet configurations; increase the predictive capability of V/STOL related flow phenomena such as suckdown, hot gas reingestion and entrainment. These latter effects have a significant impact upon design analysis and evaluation for future Navy V/STOL aircraft.

(a) Theoretical: review existing modeling techniques for jet flows and extend concepts to the V/STOL environment. Develop computer techniques as analytic tools, and correlate results with existing data. (b) Experimental: conduct appropriate experiments for confirmation of new modeling techniques.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0003, TITANIUM FIRES - TITANIUM ALLOY IGNITION AND COMBUSTION STUDY
B.A. Manty, United Technologies Corp., Pratt & Whitney Aircraft Group, *P.O. Box 2691, West Palm Beach, Florida* 33402 (DN881167; N62269-77-C-0481)

The objective of this task is to apply the Glickstein model to various titanium alloys used in jet engines (Ti-8-1-1, Ti-6-4, Ti-6-6-2, Ti-6-2-4-2, and Ti-6-2-4-6) at several temperatures and establish its validity by studying the ignition and propagation characteristics in simulated compression environments. Determine parameters for design engineers. Determine the effects of alloying elements on the extent to which burning will be sustained. Determine the effects of coatings on ignition and propagation characteristics. This contract supports work unit ZM601, DN 681081.

Ignition and sustained combustion of titanium alloys are closely related phenomena. A laser beam will be utilized to cause ignition of an airfoil-shaped specimen in a special test rig. The aerodynamic and propagation mechanisms will be varied to simulate actual conditions. Once the various mechnaisms are understood the Glickstein analytical combustion model will be tested for its accuracy in predicting the process. The end result is to have significant parameters to provide titanium fires in operational jet engines.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0004, TRAJECTORIES OF LIQUID DROPLETS EJECTED FROM AN AGRICULTURAL AIRCRAFT
A.I. Ormsbee, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Aeronautical & Astronautical Engineering, *207 Engineering Hall, Urbana, Illinois* 61801

Flow field models for an agricultural aircraft are being constructed for the determination of trajectories of droplets and solid particles ejected from the neighborhood of the wing trailing edge. Trajectories have been computed for a horseshoe vortex model in ground effect, and scaling laws for scale model testing have been established. Inclusion of propeller wake effects has been effected. A test program has been completed and the final report is in preparation.

SUPPORTED BY University of Illinois

1.0005, THUNDERSTORM FORECASTING FOR AVIATION
M.A. Alaka, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Weather Service, Systems Development Office, Techniques Development Laboratory, *8060 13th St., Silver Spring, Maryland* 20910 (RD5901)

OBJECTIVE: To develop, for the benefit of aviation, improved automated techniques for monitoring and forecasting thunderstorms in the 0-2 h range. To implement these techniques in the appropriate operational environment.

APPROACH: Statistical techniques will be used to generate 0-2 h probability and categorical forecasts of thunderstorms from digitized radar data, alone or in conjunction with other meteorological data.

PROGRESS: Forecast equations have been derived from a small set of dependent data. Efforts are underway to increase this data base. Display techniques have been developed for the D/RADEX System, and plans for testing them are being prepared.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin., Systems Research & Development Service

1.0006, NAVY VEHICLE DESIGN AND CONSTRUCTION - V/STOL LIFT JET INTERACTIONS
D. Kotansky, McDonnell Douglas Corp., *P.O. Box 516, St. Louis, Missouri* 63166 (DN975280; N00014-79-C-0130)

The successful design and development of VTOL aircraft equipped with powered lift-jet or powered lift augmentation systems requires a knowledge of the complex flow fields produced by these multiple jet lift systems in the hover mode both in and out of ground effect. Fundamental understanding of fountain upwash formation and development is a key element in the improvement of methods for the prediction of VTOL vehicle

aerodynamic performance characteristics in ground effect. Inaccurate or incomplete prediction of vehicle forces and moments in ground effect can lead to serious vehicle performance and stability and control problems in the vehicle development process. It is the objective of this experimental investigation to establish a quantitative link between the wall-jet flows on the ground plane and the resulting fountain upwash prior to airframe undersurface impingement.

The experimental apparatus will consist of a two jet nozzle arrangement with jet impingement normal to the ground plane. Both equal and unequal jet strengths will be considered. Precise hot film anemometer measurements will be made of the mean velocity profiles of wall jets prior to their interaction to form fountain upwashes. The fountain upwash flow will be surveyed immediately above the fountain formation region and at different heights in the upwash flow field.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

1.0007, WING-STORE FLUTTER ANALYSIS METHODS
Unknown, Grumman Aerospace Corp., *S. Oyster Bay Rd., Bethpage, New York* 11714 (DN890167; N00019-79-C-0062)

Evaluate effectiveness of using automated numerical search techniques to identify the most critical wing-store flutter conditions for realistically complex configurations.

Extend existing search algorithms to accommodate non-constant constraints on search parameters (store properties) and include store center-of-gravity locations and pylon flexibilities as additional search parameters. Compare analysis with wind-tunnel and flight data.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0008, MARITIME PATROL AIRSHIP STUDY
N.D. Brown, Goodyear Aerospace Corp., *1210 Massillon Rd., Akron, Ohio* 44315 (DN981126; N62269-78-M-4580)

Design maritime patrol airship to U.S. Navy and U.S. Coast Guard requirements. In support of work unit No. DH814 and Agency Accession No. 881665.

Based on mission requirements provided by the Navy, design a maritime patrol airship complete with principal design and performance characteristics.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0009, NAVY VEHICLE DESIGN AND CONSTRUCTION - LIFTING SURFACE THEORY FOR THRUST AUGMENTING EJECTORS (ABBREV)
P.M. Bevilaqua, Rockwell International Corp., Columbus Aircraft Division, *4300 E. 5th Ave., Columbus, Ohio* 43216 (DN875520; N00014-78-C-0557)

The objective of this investigation is to develop a computational technique for thrust augmenting ejector analysis that will include the effects of conditions external to the ejector as well as flow within the ejector shroud. For thrust augmenting ejectors in V/STOL aircraft applications, the influence of the aircraft wing/body, the proximity of the ground in landing and takeoff and the requirement for shorter, more compact diffuser sections all have an influence on augmentor performance. Classical ejector analysis considers only conditions internal to the ejector shroud and therefore cannot satisfactorily predict overall ejector performance when installed in a V/STOL configuration.

The approach taken in this effort is to separate the ejector flow field into two regions: the flow through the ejector and the flow external to the ejector. A viscous inner solution that accounts for upstream influence is matched to an inviscid outer solution including free stream velocity normal to the ejector axis.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

1.0010, ACTIVE FLUTTER SUPPRESSION APPLICATION
L.J. Huttsell, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF140410)

High performance fighter-attack aircraft are required to carry many combinations of external wing-mounted stores to obtain operational effectiveness. However, some wing/store configurations are found to be critical from the standpoint of preventing flutter from occurring within the desired operational flight envelope. Speed placards are the only suitable means of preventing this flutter, but this technique generally results in significant losses in aircraft performance. The objective of this program is to investigate via analyses the capability of various flutter suppression schemes.

Analyses will be conducted on the wing/store flutter suppression models developed under AFFDL contract to verify the control system design and to determine alternate compensation schemes. Along with the analytical effort, ground tests will be conducted on the flutter suppression model to verify the model and control system dynamics and to provide data to update the analyses. Analyses will be also conducted on other configurations (e.g., bending-torsion flutter) to provide bases for future wind tunnel tests.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0011, RELATIONSHIP BETWEEN PRODUCTIVITY AND R&D EXPENDITURES - THE CASE OF COMMERCIAL AIR TRANSPORTATION
R.C. Lenz, University of Dayton, Research Inst., *300 College Park Ave., Dayton, Ohio* 45469 (SRS79-10397)

Relationship between productivity and R&D expenditures in the U.S. commercial air transportation industry are the focus of this study. It will provide new information on the effectiveness of R&D investment for an industry of major economic importance which has demonstrated a high rate of increase in productivity. The project will examine data for 30 years and will research sequential relationships between R&D and productivity increases. This study will contribute materially to the literature quantifying the rate of return on R&D investment and will serve as a basis for further extension of the proposed method to other industries.

SUPPORTED BY U.S. National Science Foundation, Directorate for Scientific Technological & Internat. Affairs, Div. of Science Resources Studies

1.0012, REVIEW OF V/STOL CONCEPTS AND DEVELOPED AIRCRAFT
B. Lindenbaum, University of Dayton, School of Engineering, Dept. of Mechanical Engineering, *300 College Park Ave., Dayton, Ohio* 45469 (DN890146; N0019-78-C-0552)

Compile program data and technical data and assessment for all significant V/STOL aircraft concepts developed to date.

A group of highly qualified experts in the field of V/STOL aircraft will compile all necessary data and assessments, transform these data into a standard format and integrate them into a final report.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0013, ADVANCED COMPOSITE AFT FUSELAGE STRUCTURE DEVELOPMENT
C. Foreman, Vought Corp., *P.O. Box 5907, Dallas, Texas* 75222 (DN981066; N62269-78-C-0502)

The design and development of advanced composite aft fuselage types of construction which can satisfy the configuration and structural loading requirements of future naval aircraft, and the fabrication of critical structural subcomponent test specimens.

This is an eighteen month program consisting of two phases. In phase I the basic preliminary design will be performed including definition of materials, material combinations, material forms, type of construction, method of fabrication and

realistic cost impact. Element and coupon tests will be performed. The second phase will consist of prototype design and the design and fabrication of a critical subcomponent, and the preparation of detailed test plans for this subcomponent.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0014, SUPERSONIC WAVE DRAG PREDICTION

R. Stancil, Vought Corp., Flight Technologies Division, *P.O. Box 5907, Dallas, Texas* 75222 (DN879006; N00167-78-C-0005)

To derive improved techniques for predicting supersonic wave drag on generalized aircraft configurations. This contract is in support of DTNSRDC work unit 1600-078, reported under DN778004.

Apply the modified linear theory method (developed by the contractor) to overcome limitations of current supersonic area rule method. The modified linear theory calculation will be programmed into a non-axisymmetric body computer routine with an input geometry definition subroutine. A graphics geometry editing routine will also be incorporated. Prepare and verify program. Furnish program decks, user's manual and user training.

SUPPORTED BY U.S. Dept. of Defense, Naval Ship Research & Development Center, Aviation & Surface Effects Dept.

1.0015, MINI-RPV (REMOTELY PILOTED VEHICLES) PROPELLERS FABRICATION

R. Marker, Systems Research Lab. Inc., Rasa Division, *1055 J. Clyde Morris Blvd., Newport News, Virginia* 23602 (DA0E3851; DAAK51 78 C 0007)

To fabricate, by injection molding, 76 carbon/nylon, small diameter (21-30 inches) propeller blades using four (4) different open and ducted propeller blade aerodynamic designs furnished by the government.

TASK I - Analysis and Design: (a) conduct stress analysis to define blade retention; (b) conduct analytical vibration analysis; (c) perform detailed designs of total blade using government-furnished engine and airfoil data. TASK II - Templates and Molding of Test Blade: (a) make required aluminum blade airfoil section templates and wooden patterns for casting aluminum mold cavities; (b) injection mold a minimum of 8 blades of critical design. TASK III - Design Verification: (a) conduct static blade tensile tests to failure using carbon/nylon; (b) revise blade molds and conduct static load tests as required; (c) perform dynamic (spin) test of critical blade design using contractor test hub. TASK IV - Blade Fabrication and Final Static Proof Test: (a) fabricate 76 final blade designs, to include machined shank and retention for ground adjustability; (b) one blade of each of the four designs shall be static proof tested. Data vibration analysis fan plots for each blade design, static and dynamic test reports and drawings shall be furnished the government.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Applied Technology Lab.

1.0016, AERODYNAMICS OF BALLISTICALLY DAMAGED ROTOR BLADES HT 79-15

D. Hollenbaugh, U.S. Dept. of Defense, Army, Aviation Research & Development Command, Applied Technology Lab., *Fort Eustis, Newport News, Virginia* 23604 (DA0E3862)

To establish a realistic data base in the area of ballistically damaged rotor airfoil sectional aerodynamic forces in order to develop a better understanding of the effect of aerodynamic changes due to ballistic damage on helicopter performance.

Wind tunnel tests will be conducted of both standard metal and experimental composite material rotor blade sections. Two sets of tests will be run. The first will use sections with mechanically simulated damage to isolate the parametric effects of hole size, chordwise location, and peelback area. The second will use specimens damaged by 23mm HEI rounds for exact realistic correlation. Tests shall be conducted over a range of Mach numbers and angles of attack to simulate spanwise position and flight condition.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Applied Technology Lab.

1.0017, HELICOPTER FATIGUE LIFE MONITORING REQUIREMENTS/BENEFITS EVALUATION

Unknown, Veda Inc., *1755 Jefferson Davis Hwy., Arlington, Virginia* 22202 (DN890130; N00019-78-C-0597)

Identify the utility of in-service fatique monitoring of Navy/Marine helicopters to acquire information concerning life expenditure of critical rotating and non-rotating components.

A study will be made of the effects of variations from assumed design mission usage on the life expenditure of critical components. The likely impact of such differences in life expenditure (if they were known) on maintenance/rework actions will be determined to permit evaluation of worth of alternative life monitoring systems.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0018, NEW STRATEGIC AIRLIFT CONCEPTS

E.A. Barber, Boeing Co., *7555 E. Marginal Way S., Seattle, Washington* 98124 (DF141230; F33615-78-C-3024)

An analysis of a future conflict between NATO and Warsaw Pact forces indicates intense fighting, with corresponding rapid consumption of military equipment. This equipment must be replaced, and supplemented, at a rate possible only with rapid airlift. This scenario is the consequence of the increasing size of the Warsaw Pact forces, and it places demands on MAC and the strategic airlift equipment unforeseen a few years ago. The situation will require additional airlift resources, which may require the design of a new AF cargo aircraft. The AFFDL has the responsibility to conduct design integration studies and technology development for future systems. A conceptual design program will be conducted to determine the feasibility of new strategic airlift aircraft.

A contractor shall conduct a design integration study within the context of a scenario involving airlift to NATO forces. The design requirements will incorporate the findings of the massive rapid resupply study contracts presently being performed. The analysis will define the vehicle in terms of range, payload, speed and related parameters, as well as force size, maintenance requirements, interface with Army equipment, and similar support requirements. The payload requirements will reflect projections of future Army weapons specifically designed for the intense NATO conflict. The findings from this study will be suitable for specifying future technology requirements.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0019, SUPERSONIC WING-BODY ANALYSIS AND DESIGN

P.E. Rubbert, Boeing Co., *7555 E. Marginal Way S., Seattle, Washington* 98124 (DF139590; F33615-77-C-3051)

This work will be in support of designing and analyzing fighter aircraft becoming operational in the 1985 time frame. Many of these aircraft have geometrical shapes that present considerable difficulty in estimating aerodynamic properties. This includes calculations of the flow in and around the region of the engine inlet and over a highly blended wing/fuselage/inlet shape typical of advanced supersonic fighters. This effort will allow the aerodynamic properties of a vehicle to be estimated without running tunnel tests on impractical shapes. This will represent a substantial cost saving to the Air Force and will result in a computer program capable of computing the flow over highly complex aircraft shapes at supersonic speeds.

An advanced paneling method will be used to describe the aircraft to a computer program. This technique can be used to calculate the three-dimensional flow field about a complete aircraft. It is also amenable to the computation of internal flows such as ducts, inlets, and wind tunnels. This method will make use of source and doublet panels as the basic building blocks for geometrically describing the aircraft configuration. Output data

would consist of pressures and velocities at all boundary points, three component forces and moments, and streamlines both on the aircraft and in the flow field.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0020, TRANSONIC UNSTEADY WIND TUNNEL MEASUREMENTS ON AN OSCILLATING WING WITH TIP STORES
H. Tijdeman, National Aerospace Lab., *Amsterdam, Netherlands* (DF140100; AFOSR-77-3233)

This work unit supports the aeroelastic evaluation of high speed aircraft. It will contribute to the development of improved unsteady aerodynamic methods to predict aircraft aeroelastic stability and structural dynamic response. The goal is to conduct unsteady aerodynamic tests on oscillating models in transonic wind tunnels, resulting in ultimate savings in the costs to design new aircraft. The capability to make these measurements will allow the orderly development of necessary analytical methods to optimize aircraft structures for minimum weight and cost.

The proposed effort is to perform transonic unsteady wind tunnel measurements on an oscillating wing with external stores. The objective is to obtain experimental data to guide improvements in transonic unsteady theories which will be used to ascertain flight safety of future air-combat fighters with respect to wing flutter.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, MATERIAL SUPPORT TECHNOLOGY - GUIDED ELASTIC WAVE PROPAGATION IN FERROIC MATERIALS
R.A. Auld, Stanford University, W.W. Hansen Lab. for Physics, Dept. of Applied Physics, *Stanford, California* 94305 (DN975336; N00014-79-C-0222)

Radar command and communications devices use delay lines. The objective of this work will be to study the fundamental aspects of elastic wave trapping and propagation at materials interfaces which could possibly result in new acoustic delay devices. This study will be concerned with the critical material properties at the interfaces that will enable elastic wave trapping and control subsequent propagation of the elastic wave.

The conditions necessary for elastic wave propagation at interfaces between oppositely polarized regions in both electrostrictive and piezoelectric ceramics will be studied. Effects of material properties such as elastic stiffness and piezoelectric coupling, of scattering and depolarization due to variations in local polarization, and of interface thickness on elastic wave trapping and propagation will be carried out. Similar studies of the above properties for single crystal domain walls in both ferroelectric and ferroelastic materials will also be studied.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0002, THEORY OF MANY-BODY PROCESSES IN CHEMICAL PHYSICS
W.P. Reinhardt, University of Colorado, Boulder Campus, School of Arts & Sciences, Dept. of Chemistry, *1200 University Ave., Boulder, Colorado* 80302 (CHE77-16307 A02)

Reinhardt and co-workers will continue to develop and to exploit ideas of L2 discretization of the continua involved in scattering, photoabsorption, and intense field multiphoton absorption and ionization, with special attention paid to the multiple continua which arise in single photon double electron ejection, heavy particle impact dissociation, and intense field processes. Systems such as H, He, O2, N2, NH, NH2, CH3-, LiF-, NaCl-, He2 ion, Ne ion will be involved in such studies. In related areas they will investigate the use of Lie group techniques and classical and semiclassical methods to obtain improved understanding and predictive abilities in dealing with atoms and molecules in highly excited states, and in intense field processes. Taking further advantage of recent rapid developments in classical and semiclassical mechanics, they will undertake development of a new formulation of unimolecular processes. Finally, beginning with the recent synthesis of scattering data suggested by the surprisal techniques of Levine and Bernstein, an attempt will be made to develop a formulation of quantum scattering theory appropriate to direct determination of various moments of the S-matrix, rather than the whole S-matrix itself.

This research represents a continuation of that currently supported by Foundation grant CHE-7419605.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

3.0003, NEUTRON DIFFRACTION CRYSTAL AND MOLECULAR STRUCTURE STUDIES
J.M. Williams, Argonne National Lab., *9700 S. Cass Ave., Argonne, Illinois* 60439 (CHE78-20698)

The neutron diffraction structural studies of several academic scientists at Argonne National Laboratory are supported by a grant from the Structural Chemistry and Thermodynamics Program. Although a variety of research problems will be solved with the assistance of neutron diffraction data, a common objective of all projects will be the exact specification of hydrogen atoms in complex molecular systems. In particular, metal hydride and cluster compounds will be examined with the specific purpose of providing quantitative structural parameters for catalytic models.

This research is a continuation of that currently supported by Foundation Grant, CHE-7726650.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0004, LOCAL ATOMIC ARRANGEMENTS IN ALLOYS AND INTERMETALLICS
J.B. Cohen, Northwestern University, Evanston Campus, Technological Inst., Dept. of Materials Science, *633 Clark St., Evanston, Illinois* 60201 (DMR76-80662 A02)

This is a continuation of research employing X-ray and neutron diffraction techniques to characterize atomic arrangements in metallic materials associated with important dynamical lattice events. Among the areas under investigation are: 1. heterophase fluctuations in alloys which undergo phase transitions; 2. kinetics of order-disorder reactions; 3. premonitory effects prior to the first-order reaction in Cu3Au to ascertain if these are associated with anharmonic effects and possible relationship to other kinds of first-order transitions; 4. diffuse neutron scattering from age-hardened Al-Cu alloys to define quantitatively the internal stucture of a Gunier-Preston zone by computer simulation with measured short-range order parameters and displacements; 5. local atomic arrangements in ternary Heusler alloy systems which exhibit different ordering temperatures; and 6. detailed determination of the defect state in Ni1 plus or minus x Al1 plus or minus x to obtain the Warren short-range order parameters and, with computer simulation, the details of non-random arrangement. Lastly, a new method of diffuse scattering analysis is under study which could, for the first time, yield the separate mean displacement of AA and BB pairs in a concentrated binary alloy, and allow computer simulation of these displacements. This is a renewal of NSF Grant DMR73-07549-A01.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0005, RESEARCH INITIATION - REACTION OF POWDER INJECTION INTO LIQUID METALS
M. McNallan, University of Illinois, Chicago Circle Campus, School of Engineering, Dept. of Materials Engineering, *Box 4348, Chicago, Illinois* 60680 (DMR79-08198)

Despite the wide utilization of powder injection in process metallurgy, no general model has been established which can predict the reaction rates of the injected powders. The goal of

this research is to develop an advanced model of the reactive powder injection process by making use of current knowledge of the fluid dynamics of submerged gas jets. The effects of powder injection on the fluid dynamics of these jets will be determined. The reaction model will be tested and refined by applying it to the problems of copper deoxidation by injected powders. The oxygen concentration in the copper will be monitored continuously during the injection using a lime stabilized zirconia electrochemical cell. The fluid dynamics of the gas-particle jets in the liquid copper will be monitored by recording the pressure fluctuations in the nozzle. The effects of changing system parameters such as injection velocity, powder to gas ratio, and jet orientation will be investigated as well as the effects of changing powder properties such as particle size, density, and chemical nature.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0006, ELECTRONIC STRUCTURE AND MOMENTUM DISTRIBUTIONS FROM ELECTRON IMPACT IONIZATION

M.A. Coplan, University of Maryland, College Park Campus, Inst. for Physical Science & Technology, Dept. of Chemistry, *College Park, Maryland* 20742 (CHE79-09430)

This research is in the area of quantum chemistry. Drs. Coplan, Moore, and Tossell are applying a recently-developed coincidence technique, using a multiple detector spectrometer controlled by a microcomputer, to problems of electronic structure and bonding in molecules. An expanded program is planned to follow-up the consequences of the work already accomplished as well as to extend the method to nitrogen bases, inorganic molecules with third-row atoms and transition metal atoms, thin films and molecules adsorbed on surfaces. To carry out the program a second bakeable spectrometer with higher energy resolution will be built. A sample handling system capable of transferring the vapors of the less volatile compounds will also be constructed. This research represents a continuation of that currently supported by Foundation grant CHE7615886.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0007, MECHANISMS FOR FAST DIFFUSION IN METALS

D. Turnbull, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Engineering & Applied Physics, *Cambridge Station, Cambridge, Massachusetts* 02138 (DMR77-10151 A02)

Research previously supported by DMR76-21629.

The mechanisms underlying the phenomenon of 'fast diffusion' in metals will be investigated. The research will be centered on (1) the problem of the distribution of fast diffusing impurities over the various states (e.g., interstitial, atomic exciton, substitutional or cluster states) and (2) the effect of this distribution on the mechanical and electrical behavior of the alloys.

In particular, the research will include (1) the characterization of the effects of Au and Ag dissolution and precipitation on the yield stress of Pb single crystals at low temperature. Also, these effects will be interpreted on the basis of the knowledge of the states of impurity derived from the diffusivity and resistometric studies, (2) the measurement of the kinetics of formation of Au clusters resistometrically, and (3) the performance of Kirkendall type experiments, resistometric and position studies on the system Pb(Zn) in order to seek further evidence for the atomic mechanism of transport.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0008, CHARACTERIZATION OF HELICOPTER MATERIALS HARDENED AGAINST HEL RADIATION

R. Fitzpatrick, U.S. Dept. of Defense, Army, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center, *Watertown, Massachusetts* 02172 (DA0F4703)

The objective of this research effort is to provide data on the effects of high energy laser radiation on ceramic, metal and polymer materials that are planned for use in advanced Army systems. Hardening techniques will be applied and the relative merits of the hardening approaches will be measured.

Structural components in the form of hollow tubes and flat plate members will be irradiated while under load using both continuous wave and repetitively pulsed laser radiation at 10.6 microns. In addition, large diameter thin walled pressure missles will be flood loaded using large diameter CO2 laser beams. The large diameter cylinders will not be hardened in order to develop baseline response data. The test conditions will be carefully chosen to simulate the actual environment that the full scale Army system will be exposed to in a combat situation.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center

3.0009, A STUDY OF THE SURFACE PLASMON STATE IN METALS AND DISORDERED BINARY ALLOYS

A.S. Karakashian, University of Lowell, Research Foundation, *Lowell, Massachusetts* 01854 (INT78-28037)

This award provides travel funds to allow co-principal investigators Dr. A. S. Karakashian and Dr. Y. Y. Teng, University of Lowell, to cooperate with Dr. K. P. Wang, National Taiwan University, and Dr. K. C. Lee, National Central University, Taiwan, on a study of the surface plasmon state in metals and disordered alloys. Refined and extended measurements of the electromagnetic waves detectable at the surface of metals and alloys will be made. Values of the fundamental electronic properties of metals and alloys, namely the bulk plasma frequency, the collision time, the conduction electron concentration, and the effective conduction electron mass will be determined. Drs. Lee and Teng, both experimentalists, will conduct complementary experiments at their respective institutions, while Drs. Wang and Karakashian, both theorists, will be responsible for calculations of surface plasmon excitation and propagation. This study is expected to better define the high frequency electronic properties of alloys and has importance in applications where alloys are exposed to these frequencies such as satellites, high altitude aircraft, etc. The project has been approved under the U.S.-Taiwan Cooperative Science Program and the counterpart scientists in Taiwan will receive support for their participation from the National Science Council.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Scientific Technological & Internat. Affairs, Div. of International Programs

3.0010, CHEMICAL AND MICROSTRUCTURAL EFFECTS ON THE FRACTURE CHARACTERISTICS OF HIGH DENSITY POLYCRYSTALLINE ALUMINA

D.W. Smith, Michigan Technological University, School of Engineering, Dept. of Metallurgical Engineering, *Houghton, Michigan* 49931 (DMR79-10012)

An investigation of the relationship between the fracture behavior of high density polycrystalline alumina and its microstructure and impurity distribution will be continued. The fracture toughness of alumina has been found to decrease as a result of calcium segregation to grain boundaries. Further studies will examine how doping with yttrium influences grain boundary segregation and intergranular versus transgranular fracture. Specimens of different doping concentrations will be prepared by hot pressing. Grain boundary segregation of impurities will be determined by Auger electron spectroscopy, and information concerning the crystallographic nature of cleavage will be determined by scanning transmission electron microscope electron channeling patterns.

This is a renewal of NSF Grant DMR76-08467.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0011, MATERIAL SUPPORT TECHNOLOGY - ELECTRIC, MAGNETIC AND THERMAL PROPERTIES OF MATERIALS FOR CRYOGENIC DEVICES

J. Daunt, Stevens Inst. of Technology, Cryogenics Center, *Castle Point Station, Hoboken, New Jersey* 07030 (DN775424; N00014-77-C-0404)

The objective of this task is to study the electronic, magnetic and thermal properties of cryogenic materials for use in superconducting surveillance and communication devices of interest to the Navy.

This task comprises a variety of experimental techniques. They include: (1) specific heat measurements of helium and xenon films on homogeneous substrates, (2) specific heat measurements of solid hydrogen isotopes and solid mixtures of the hydrogen isotopes down to about 0.1 degrees K, (3) continuous wave NMR studies of He3 submonolayer and multilayer films on coated homogeneous substrates, and (4) continuous wave NMR studies of solid hydrogen isotopes to tempeatures near 0.1 degrees K.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0012, MICROMECHANICAL PROPERTIES OF CRAZES 16123-MS

E.J. Kramer, Cornell University, Ithaca Campus, School of Engineering, Dept. of Materials Science & Engineering, *242 Carpenter Hall, Ithaca, New York* 14853 (DA0G8987; DAAG29-79-C-0015)

To conduct studies of the micromechanical properties and structure of crazes in polymers which are brought about under both dry and environmental conditions. Relevance - crazing has been identified as a frequent precursor to fracture of polymeric materials which are important components of fuzes, gas masks, and other items of personnel protection and support, packaging, and aircraft canopies.

A new quantitative transmission electron absorption microscopy technique with very high spatial resolution will be used in the measurement of the micromechanical properties of crazes. The research includes comparisons of crazes grown in homogeneous stress fields and those in inhomogeneous fields; crazes grown in time-varying stress fields will be studied, as will the detailed structure and properties of the craze tip; molecular weight effects, strain hardening as related to molecular weight, and the influence of solute diffusion on the thickening mechanisms of environmental crazes are also topics to be studied.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

3.0013, SILICON CARBIDE EPITAXY FOR ELECTRONIC DEVICES

R.F. Davis, University of North Carolina, North Carolina State University, School of Engineering, Dept. of Materials Engineering, *Raleigh, North Carolina* 27607 (DN975244; N00014-79-C-0121)

This work seeks new approaches to reliably and reproducibly grow silicon carbide of semiconductor grade for use in higher temperature Navy electromagnetic systems.

Cubic (beta) silicon carbide epitaxial films will be grown by organometallic low pressure vapor phase deposition and evaluated for its electronic properties. High pressure, high temperature growth technology will be developed as a backup.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0014, DEVELOPMENT AND APPLICATION OF MOLECULAR ORBITAL THEORY

J.A. Pople, Carnegie Mellon University, Graduate School, Dept. of Chemistry, *Frew Ave. & Margaret Morrison, Pittsburgh, Pennsylvania* 15213 (CHE79-01061)

This grant supports research under the Quantum Chemistry Program for the development of molecular orbital theory, and its application to significant chemical problems. The techniques will be developed in a manner that will allow experimental chemists to use them on their own for investigations of molecular structure and reactivity. Applications receiving particular attention will include problems related to molecular vibrations and exploration of reactive energy surfaces.

Professor Pople will continue his theoretical investigations on the development of 'model chemistries'. These will include models of electron correlation, with particular emphasis on methods for the rapid evaluation of energy derivatives with respect to nuclear positions. An aim of this research is to open up the systematic exploration of reactive potential energy hypersurfaces for polyatomic intermediates. Key features of topology of these surfaces will be identified, with a view towards relating them to rates of elementary chemical reactions.

This is a renewal of research currently supported by NSF grant CHE7509808 at Carnegie Mellon University.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0015, LOCALIZED ELECTROCHEMICAL CORROSION CELLS 15539-MS

B.F. Brown, Brown University, Graduate School, *University Hall, Box 1883, Providence, Rhode Island* 02912 (DA0F9298; DAAG29-78-G-0165)

To determine the solution chemistry of electrolytes existing in localized corrosion cells (e.g., pits and propagating stress corrosion cracks), and to investigate the corrosion behavior of metals in these solutions. Relevance - the research has relevance to inhibition of corrosion and catastrophic failure in aircraft, mobility vehicle structures and lightweight armor.

Macroscopic cells will be utilized which contain the concentrated electrolyte as determined by experimental measurements on solutions in propagating cracks in aluminum and other metals. Aluminum and other metal specimens will be exposed to the concentrated electrolyte to determine corrosion response, effect of environment on rate of repassivation of newly exposed surfaces, and electrochemical reaction kinetics of the specimen electrodes as a function of electrolyte chemistry.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

3.0016, REAL-TIME DAMAGE MODES IN CARBON-CARBON COMPOSITE MATERIALS

P.H. Francis, Southwest Research Inst., *8500 Culebra Rd., P.O. Drawer 28510, San Antonio, Texas* 78228 (DN775516; N00014-77-C-0510)

Carbon-carbon materials are used in propulsion and reentry components of advanced strategic systems. Failure modes and mechanical properties are significantly affected by initial defect and flaw distributions and subsequent progressive damage under load. Significant damage (beyond the initial damage) can occur throughout the part under load before failure occurs. This research program will identify damage modes/mechanisms and subsequential constituent failure. Residual stresses, especially in circumferentially woven carbon-carbon materials, may significantly affect failure/damage behavior.

A significant number of carbon-carbon material test specimens will be evaluated. Test methods will be developed to utilize partial ring test specimens. Residual strains will be evaluated. Acoustic emission and scanning electron microscopy techniques will be used.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0017, SYNTHESIS AND PHYSICAL PROPERTIES OF TRANSPARENT ENGINEERING THERMOPLASTICS BLOCK COPOLYMERS 14072-C

J.E. McGrath, Virginia Polytechnic Inst. & State University, School of Arts & Sciences, Dept. of Chemistry, *Blacksburg, Virginia* 24061 (DA0E9199; DAAG29 76 G0312)

It is proposed to investigate ductile glassy-glassy and glassy-crystalline block copolymers. Specifically, poly (aryl ether) polycarbonate and poly (aryl ether) - poly (alkylene terephthalate) systems will be studied in detail. Relevance - these new block copolymers potentially will have excellent dynamic,

mechanical and high strain rate properties and resistance to solvents. They will be candidate materials for helicopter windshields and as thermoplastics for engineering materials requiring stringent performance characteristics.

The chemistry and structural features that control phase separation and morphology will be investigated through the variation of the bisphenol in the polycarbonate structure, the diol in the terephthalate, block lengths, and block regularity. The dynamic shear moduli over a wide range of temperatures and frequencies will be used in evaluating viscoelastic characteristics.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

3.0018, MICROWAVE SPECTROSCOPY OF MOLECULAR IONS AND OTHER TRANSIENT SPECIES
R.C. Woods, University of Wisconsin, Madison Campus, School of Letters & Science, Dept. of Chemistry, *500 Lincoln Dr., Madison, Wisconsin* 53706 (CHE79-50005 A07)

Professor Woods is supported by a grant from the Structural Chemistry and Thermodynamics Program to measure structural parameters for molecular ions. The construction of the apparatus necessary to measure not only microwave, but also optical and quadrupole mass spectroscopic data, will be completed. This instrumentation is unique and is required for determining accurate structural details for unstable, transient species. These structural species are central to the understanding of chemical reactions not only in laboratories, chemical plants, and the environment, but also in the astrophysical realm. The advanced measurement instrumentation developed under Woods' direction is expected to provide unique structural parameters.

This reseach is a continuation of that currently supported by Foundation Grant, CHE-7607374.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, MISSILE TECHNOLOGY/GSE - ROCKET EXHAUST EFFECTS
D.L. Booker, U.S. Dept. of Defense, Army, Missile Research & Development Command, Technology Lab., *Redstone Arsenal, Huntsville, Alabama* 35809 (DA0G1132)

To obtain a theoretical model describing the flow of a rocket exhaust gas in a lightweight cylindrical tube during the launch phase. The model will include the effects of real gas flow, spin vane disturbance, and various nozzle and launch tube configuration parameters. Subscale cold gas experimental data performed at the University of Texas will be used to substantiate the computer results. To eliminate massive 'blow-by' during launcher design by the development of designer guidelines.

Contractor effort will be monitored closely to provide direction and support in the development of the overall ongoing program. Existing and future programs will benefit from the data as it becomes available through application of the theory and test results.

SUPPORTED BY U.S. Dept. of Defense, Missile Research & Development Command, Technology Lab.

4.0002, PASSIVE SEISMIC SURVEILLANCE
N.N. Bojarski, (No Performing Organization Reported), *California* (DN975321; N000140-79-C-0189)

In many military situations one wants to determine information about a source from remotely sensed data. Examples include the determination of a gun position, the direction of low flying aircraft and missiles, and tank and troop movements from data gathered by remote acoustic or seismic sensors. The objective of this task is the development of mathematical techniques for extracting desired information from gathered data.

Mathematical inverse problem techniques will be applied to the problem of locating gun positions from remotely sensed seismic data. Associated graphics will be explored to clearly represent solutions.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0003, TRAILING EDGE SEPARATION ON AIRFOILS
T. Cebeci, California State University & Colleges, California State University, Long Beach Campus, School of Engineering, Dept. of Mechanical Engineering, *6101 E. 7th St., Long Beach, California* 90840 (DN775166; N00014-77-C-0156)

A major factor which influences the characteristics of airfoils and wings is the nature of the flow in the vicinity of the leading and trailing edges. The proposed research will be a theoretical study of the onset of unsteady separation in such regions at low speeds. In addition, studies will be made of: (a) the effects of roughness on two-dimensional and axially symmetric bodies at high Reynolds numbers; and (b) the drag of wings at small incidence.

The separation phenomenon will be studied, initially, within the framework of classical boundary layer theory; subsequently, it will be studied within the framework of interacting boundary layer theory. The separation region will be required to be slender. The emphasis will be on unsteady laminar flow; some consideration may be given to turbulent flow.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0004, CHARGE TRAPPING IN SILICON DIOXIDE
B. Deal, Fairchild Camera & Instrument Corp., Dept. of Semiconductor Device Research, *Palo Alto, California* 94303 (DN975407; N00014-79-C-0297)

Demands by future Navy and DOD electronic systems requirements for improved capability and reliability in silicon electron devices require improved understanding of the processing effects which dominate the quality of the passivating coatings. Trapping of charge in silicon dioxide as a result of fabrication methods must be understood.

Capacitance voltage measurements will be made on MoS structures produced by oxidizing silicon wafers. Avalanche charge injection will be used to study the trapping of charge in the oxide and these effects will be correlated with the trapping phenomena introduced by ionizing radiation, high field tunneling, sputtering, metal deposition, and ion implantation. Various processing variables will be studied to determine optimum conditions for minimizing trapped charge.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0005, COMMAND AND CONTROL - VOICE CONTROL, VOCABULARY DEVELOPMENT
M.W. Gradt, Logicon Inc., *P.O. Box 10179, San Diego, California* 92110 (DN875725; N00014-78-C-0692)

As aircraft design and operation get more complex, display and control functions may overload the crew member's visual and motor channels and degrade his performance. A potential solution is the application of advanced speech technology to perform certain display and control functions. A most important factor in man-computer dialogues is the vocabulary used. The vocabulary must fit the user, the machine, and meet operational/functional requirements. This research will address the problem of small vocabulary design for application to an operational fighter aircraft.

In man-computer vocabularies there are several syntactical variables; several affect the man and some affect the machine. Man's capability to learn and accept the vocabulary and the machine's ability to recognize and synthesize the words and phrases are two most important variables. The approach will involve the formulation of candidate vocabulary items and the experimental validation and optimization of the vocabulary.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0006, THE GENERATION AND GROWTH OF PC 1 GEOMAGNETIC PULSATIONS
O.G. Villard, Stanford University, School of Engineering, Dept. of Electrical Engineering, *Stanford, California* 94305 (ATM78-26842)

This grant provides funds for studies of the generation and initial growth of Pc 1 geomagnetic pulsations (frequencies 0.2 - 5 Hz). The object of the studies is to extend our knowledge of the initial phase of Pc 1 pulsation events with the ultimate goal of being able to control the pulsations and use them for active experiments in the magnetosphere and ionosphere. Each of the three component studies is based on ideas about the generation or temporal growth of Pc 1 pulsation events, and the work draws heavily on the extensive collection of ultra-low-frequency and very-low-frequency data held by the Radioscience Laboratory at Stanford. Specifically, the three studies are the following: (1) A study of the possible modification of Pc 1 pulsation activity by electromagnetic noise in the Pc 1 frequency range produced by the San Francisco Bay Area Rapid Transit (BART) System, (2) A study of the possible stimulation of Pc 1 geomagnetic pulsations by naturally-occurring repetitive very-low-frequency activity, and (3) Measurement of the initial growth of Pc 1 pulsations, and comparison of the growth characteristics with those of triggered very-low-frequency emissions.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

4.0007, ELECTRONIC SURFACE STATES OF SILICON AND III-V COMPOUND SEMICONDUCTORS
W.E. Spicer, Stanford University, Stanford Electronics Lab., *Stanford, California* 94305 (DN975214; N00014-79-C-0072)

Future electronics systems for Navy and other defense applications will require the capabilities of advanced electron and electrooptic devices fabricated on silicon and compound semiconductors. Problems of reliability, fabrication, yield, and cost are directly related to the fundamental problem of trying to understand and control the processes which occur at the surfaces of these materials and at the interfaces with metals, insulators, and other semiconductors.

Using a complementary set of surface and thin film analytical techniques, the investigator will study the fundamental interactions which occur when various metals and insulators are deposited on compound semiconductor surfaces. Auger and photoemission spectroscopies will be used. One major goal is to deduce the role of surface defects (e.g. atom removal) in pinning the surface fermi level and thus establishing the Schottky barrier potential. Other questions to be answered are: What effect does oxygen contamination of the surface have on the Schottky barrier? What is the effect of the metal alloying with the semiconductor? Does surface segregation in the three element system have any impact on the resulting potential? Another effort will begin by searching for a material which minimizes the fermi level pinning followed by controlled introduction of defects to adjust the potential for specific device requirements. Surface preparation techniques will be a parameter in all the studies. Ultra pure, cleaved silicon and gallium arsenide materials will be emphasized. Schottky barrier diodes on silicon will be studied.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0008, ABSORPTION COEFFICIENT DETERMINATION USING PULSE LASER TECHNIQUES
L.B. Stotts, U.S. Dept. of Defense, Navy, Naval Ocean Systems Center, Communications Systems & Technology Dept., *San Diego, California* 92152 (DN987518)

The primary objective of this effort is to demonstrate the feasibility of determining, in-situ, the optical absorption coefficient of ocean water using pulse laser techniques. This type of information is necessary to characterize energy transport of blue/green radiation through the ocean and will find use in proposed Navy surveillance and communications systems such as ODCS and the Navy/DARPA Strategic B/G Laser Satellite Communications Program.

An optical propagation link employing a narrow temporal pulse source and a fast irradiance detector will be immersed in an absorptive, particulate multiple scattering medium (water). The subsequent multipath time spreading of the initial pulse width by particulate multiple scattering will be recorded and used in conjunction with a radiative transfer model to determine the absorption coefficient. A comparison of this value with the known absorption coefficient of the medium will be made to assess the technique's accuracy. Various propagation media and/or propagation wavelengths will be used.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Material Command

4.0009, IMPACT IONIZATION AND HOT CARRIER TRANSPORT IN SEMICONDUCTORS 15295-EL
C.R. Crowell, University of Southern California, School of Engineering, Dept. of Electrical Engineering, *3551 University Ave., Los Angeles, California* 90007 (DA0F9082; DAAG29-77-G-0202)

To study ionization coefficients and velocity field relationships for electrons and holes in GaAs, InP and GaP. Relevance - direct and potential impact on the state of the art in photocathodes, advanced semiconductor micro- and millimeter wave devices, radar and EW systems are cited by Army reviewers.

Schottky barrier configurations will be used for carrier injection. Measurements will be made and models constructed using non-localized formulation of impact ionization. Transient analysis of space-charge limited current flow will be used for modeling velocity-field relationship.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

4.0010, A STUDY OF SATELLITE POWER SYSTEMS
R. Kasper, National Academy of Sciences, National Research Council, *2101 Constitution Ave. N.W., Washington, District of Columbia* 20418 (PRM79-19687)

The National Academy of Sciences through the National Research Council will review studies, especially those pursued by the Department of Energy, of the concept of solar power satellites. The NAS work plan will focus in particular on environmental, technological, socio-economic, and international concerns that may derive from the execution and operation of satellites to be used for the generation and transmission to earth of solar power. The NAS study will attempt to identify critical scientific and technical issues in the evaluation of the satellite solar energy system as well as point out gaps in the studies undertaken by the Department of Energy. The independent critiques to be provided by the Academy will also include a comparison of solar energy satellite systems with alternative collection and transmission energy mechanisms.

The National Research Council through its Environmental Studies Board will establish a Committee on Satellite Power Systems. This committee, in cooperation with other pertinent units of the NRC, will conduct the study. The Committee may make use of panels, workshops, symposia, public meetings, consultants or other arrangements.

The Committee will also maintain close contact with both the Department of Energy and the National Aeronautics and Space Administration.

SUPPORTED BY U.S. National Science Foundation, Office of Planning & Resources Management

4.0011, PILOT HELMET MOUNTED DISPLAY SYSTEM
J.J. Kulik, U.S. Dept. of Defense, Navy, Naval Training Equipment Center, Advanced Simulations Concepts Lab., *Orlando, Florida* 32813 (DN994011)

Design and construct a feasibility model of a pilot helmet mounted display system. Design will use latest technologies in the fields of interest, computer image generation and head and eye tracking systems, to produce small, mobile inexpensive designs with superior performance characteristics.

System concept will be formulated and required basic research and high risk areas will be defined. Several experiments will be designed to define parameters required to accommodate

the capabilities of the human in the system loop. Studies to determine some of the human physical characteristics and limitations will be made to determine maximum allowable system delay and techniques to minimize them. A breadboard to demonstrate an acceptable system time constant will be built and demonstrated. Study will be made on the visual subsystem to define required parameters. A system design will be formulated and a specification based on the design will be written. Construction of the system either in-house or under contract will be conducted.

SUPPORTED BY U.S. Dept. of Defense, Naval Training Equipment Center, Advanced Simulations Concepts Lab.

4.0012, DUST SUPPRESSION TECHNIQUES FOR ARMY OPERATIONS

G.W. Schanche, U.S. Dept. of Defense, Army, Corps of Engineers, Construction Engineering Research Lab., *P.O. Box 4005, Champaign, Illinois* 61820 (DA0C8150)

To develop and evaluate suppression techniques for limiting fugitive dusts in a combat zone. Recommended techniques will be used by field personnel in reducing visual obscuration caused by fugitive dusts on temporary helicopter landing pads, temporary landing strips, supply storage dumps, staging areas, combat roads. A report detailing the results of the study will be ready for distribution on Sept. 30, 1980. The report will include recommended dust suppression techniques including details on costs, durability and implementation procedures.

Currently available dust suppression techniques will be reviewed for applicability to the Army's needs. Where necessary, techniques will be modified or developed to fulfill the Army's needs. Several candidate techniques will be field evaluated for effectiveness, cost, durability and ease of implementation. Technique identification, modification and development will be performed in FY79. Field evaluations of candidate techniques will be performed in FY80. A technical report detailing the results of the study will be produced in FY80.

SUPPORTED BY U.S. Dept. of Defense, Corps of Engineers, Construction Engineering Research Lab.

4.0013, AERODYNAMIC NOISE GENERATION FROM AND PRESSURE STRUCTURE IN TURBULENT SHEAR FLOWS

R.G. Jones, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Nuclear Engineering/Mechanical & Industrial Engin., *207 Engineering Hall, Urbana, Illinois* 61801

The mechanisms of aerodynamically generated noise in turbulent shear flows are being studied in relation to noise suppression. Analytical models are being compared to data on both velocity and pressure field statistical structure. Models of the turbulent pressure field structure are being applied in the dilation source model to predict radiated sound fields. Prediction of far-field sound in both broad band and narrow band compares well with measured sound power levels from simple jet flows. The static pressure transducer developed in our laboratory has been verified through comparison of measurements and theory as an accurate flow field measuring sensor. Models for the equilibrium turbulence range for pressure spectra show good agreement with processed data. Pressure-velocity single point correlation measurements in the jet mixing region are being compared with turbulent energy budget predictions.

SUPPORTED BY University of Illinois

4.0014, STUDIES OF THE DYNAMICS OF THE ATMOSPHERIC SODIUM LAYER

C.F. Sechrist, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Electrical Engin, *207 Engineering Hall, Urbana, Illinois* 61801 (ATM77-00933)

This grant funds an experimental and theoretical study of the Earth's sodium layer, a permanent distribution of sodium atoms and ions located around 80-100 km altitude. In particular, it funds: 1. a computer modeling study of the chemistry and dynamics of the sodium layer. 2. a series of measurements and corresponding data analyses using the University of Illinois lidar (laser radar) system. 3. improvements in the lidar equipment. Successful completion of this work will pave the way to more definitive experimental work and will aid in understanding the ion chemistry of this region of the atmosphere.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

4.0015, FABRICATE INTERACTIVE CONTROL SURFACE MODIFICATION KIT

S. Merle, Magnavox Government & Industrial Electronics Co., *1313 Production Rd., Fort Wayne, Indiana* 46808 (DN981039; N62269-78-C-0356)

Test and evaluate an ICP interactive control panel for use with an acoustic processor such as the AN AQA 7 V 4. This contract supports work unit ZU 701, Agency Accession No. DN68 1083.

The complexity of ASW systems has increased to such a level that more control switches are now required than ever before . The load on the operator has increased to the point where it takes much training and experience to effectively operate the equipment. Operator fatique is increased and thus efficiency is decreased. The ICP was developed to relieve operator load. By employing microprocessors with programs for presentation to the operator sets of 'choices' and 'alternatives', operator 'experience' can be placed in the software. The display of alternatives and their selection by the operator will be accomplished using 'touch entry' plasma panels with computer-prompted programs.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Sensors & Avionics Tech Directorate

4.0016, SHIPBOARD LAUNCHERS

E.A. Rawls, Chrysler Corp., *Old Gentilly St., New Orleans, Louisiana* 70129 (DN782095; N00123-76-C-0741)

Develop an engineering handbook identifying blast effects from stationary shipboard launchers.

Missile systems considered for stationary shipboard launchers include variants of Standard, SeaSparrow, Harpoon, ASROC, SAM-D and SeaPhoenix. Also included are the advanced surface-to-air Ramjet missiles (ASAR), vertical ejection launched aero reaction control (VELARC) type missiles, supersonic combustion Ramjet missile (SCRAM), and any conceptual modular missile systems. A thorough analysis of blast effects for each missile system will be conducted. Blast effects include thermal, pressure, erosive, acoustic, and corrosive damage caused by main rocket motor, missile booster, ejector, or various combinations. These effects are to be considered with respect to flyaway and restrained firings for both simple blast deflectors and plenum chambers. Possible damage to both the launcher and ship structure/systems will be assessed. The analysis will be verified with blast tests. Conceptual hardware to provide solution to blast-effect problems will be designed and demonstrated. The final report is a handbook describing the effects, the problems caused, demonstrated solutions, and guidelines for further engineering efforts.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Weapons Center

4.0017, TWO-DIMENSIONAL UNSTEADY LAMINAR BOUNDARY LAYERS

K.C. Wang, Martin Marietta Corp., Martin Marietta Laboratory, *1450 S. Rolling Rd., Baltimore, Maryland* 21227 (DN875029; N00014-77-C-0650)

Unsteady separation which may manifest itself in the dynamic stall of wings and helicopter blades plays a central role in limiting the performance of many aeronautical systems. The proposed research will be directed to the development of a methodology to compute unsteady laminar flows with flow reversal and to apply this methodology to the development of a better understanding of the physics of such flows.

An unsteady, incompressible, laminar boundary layer theory will be developed for the computation of two- and three-dimensional flows. Particular emphasis will be placed on the implementation of a technique for treating the proper zones of de-

pendence implicit in the equations so that flow reversal can be studied accurately. An attempt will be made to develop a new criterion for unsteady separation. The initial studies will center about simple geometries such as ellipses and ellipsoids.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0018, NAVY VEHICLE DESIGN AND CONSTRUCTION - BOUNDARY VALUE AND NATURAL FREQUENCY ANALYSIS OF THIN SHELL STRUCTURES

B.K. Donaldson, University of Maryland, College Park Campus, School of Engineering, Dept. of Aerospace Engineering, *College Park, Maryland* 20742 (DN675635; N00014-76-C-0872)

Novel finite difference and finite element analytical techniques will be explored under this effort for the purpose of more effectively and efficiently determining the structural response of naval vehicle systems.

Research is being carried out under this task along the following lines: a new class of flat plate finite elements is being developed with straight edges such that an increased accuracy over previous elements should evolve; an improved technique is being developed to obtain increased accuracy for transient structural dynamic problems; utilization of energy techniques with arbitrary mesh finite difference grids to determine the response of plate and shell structures; and investigation of the effect of rapid load gradients on arbitrary mesh finite difference solutions.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0019, A STUDY OF ANODE PHENOMENA IN HIGH INTENSITY ARCS

E. Pfender, University of Minnesota, Minneapolis Campus, School of Engineering, Dept. of Mechanical Engineering, *105 Morrill Hall, Minneapolis, Minnesota* 55455 (ENG77-04108 A02)

The research is an analytical and experimental study of plasma-wall bounding layers and of anode phenomena induced by MHD effects as well as by melting and/or evaporation of anode material. A stepwise improvement of a previously introduced analytical model offers the opportunity to assess the importance of various effects on the arc in the anode region as, for example, convection and radiative cooling, melting, evaporation, and deviations from local thermodynamic equilibrium. The ultimate analytical models for the anode region are expected to approach experimental conditions so closely as to afford a quantitative comparison between theory and experiment. Information on the effects of anode melting and/or evaporation on the arc is obtained from time-resolved photography and qualitative spectroscopy. These results are crucial for the development of realistic models which take secondary effects into account. The research support is for the third year of NSF Grant ENG7704108 A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0020, ENGINEERING SPECIALIZED RESEARCH EQUIPMENT - DROPLET BREAKUP IN HIGH SPEED COMBUSTION GAS FLOWS

L.H. Caveny, Princeton University, School of Engineering & Applied Sciences, Dept. of Mechanical & Aerospace Engineering, *Box 430, Princeton, New Jersey* 08540 (ENG79-10884)

A high speed framing camera is to be purchased for research on the breakup of burning droplets in combustion gas flows in the Mechanical and Aerospace Engineering Department at Princeton University. The proposed camera has the additional advantage of using short strips of film which lend themselves to specialized and rapid processing in conventional laboratory darkrooms.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0021, III-V HETEROJUNCTION STRUCTURES FOR LONG WAVELENGTH INJECTION LASERS (DARPA AO 3137)

C. Nuese, RCA Corp., *Washington Rd., Princeton, New Jersey* 08540 (DA0D3115; DAAB07-76-C-0872)

To develop efficient injection lasers operating at room temperature (300 degrees Kelvin) and emitting any desired wavelength in the 0.9-1.7 micron spectral range.

Heterojunction structures of quaternary III-V alloys (such as indium, gallium, arsenic, phosphorous) will be grown by the vapor phase epitaxy method. These structures will be evaluated for lattice matching using advanced metallurgical and electrical methods. Double heterojunction injection lasers will be fabricated, their performance evaluated, and growth techniques optimized for long-life room-temperature performance.

SUPPORTED BY U.S. Dept. of Defense, Electronics Research & Development Command, Night Vision & Electro Optics Lab.

4.0022, SUPERSONIC POKER CO LASER

W. Burckel, U.S. Dept. of Defense, Air Force, Weapons Lab., *Kirtland Air Force Base, Albuquerque, New Mexico* 87117 (DF189200)

To experimentally and theoretically improve the understanding of the performance characteristics and physics of poker discharge techniques in supersonic CO electric discharge lasers. (Poker is a controlled avalanche ionization technique for high power discharge control without the use of electron beam guns.)

Laboratory experiments will be performed on a short-runtime supersonic CO electric laser using poker discharge techniques. Discharge physics and performance and stability characteristics, laser performance characteristics, and device-dependent effects will be experimentally and theoretically investigated for CW operation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Weapons Lab.

4.0023, NONLINEAR AND ACTIVE OPTICAL DEVICES

C.L. Tang, Cornell University, Ithaca Campus, School of Engineering, Dept. of Electrical Engineering, *242 Carpenter Hall, Ithaca, New York* 14853 (ENG78-09887 A01)

The main objective of this research program is to explore new active and nonlinear optical devices for use in optical communication systems. The three main goals of this effort are to develop: (1) an electrically tunable semi-conductor laser, (2) an externally controlled Q-switchable semiconductor laser in order to achieve high peak power and sub-nanosecond pulse duration, and (3) a fast optical detector using a microwave field effect transistor (FET) in gallium arsenide (GaAs).

Initial success has been obtained with an electrically tunable external cavity semiconductor laser which shows great potential. Based upon early experiments, a fast optical detector appears feasible. Further work includes the integration of such photoconductive detectors with high purity optical waveguides.

This research was previously supported under NSF Grant ENG76-11729.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0024, RESEARCH INITIATION - BROADCAST COMPUTER COMMUNICATION NETWORK DESIGN AND ANALYSIS

A. Kershenbaum, Polytechnic Inst. of New York, Brooklyn Campus, Graduate School, Dept. of Electrical Engineering, *333 Jay St., Brooklyn, New York* 11201 (ENG79-08120)

Recent advances in technology in the areas of satellites, optical fibers, cable television, and ground packet radio make broadcast network design and analysis an area of major interest in the field of computer communications. This research focuses on several fundamental issues raised by broadcast networks.

The broadcast channel has the advantage of disseminating control information simultaneously to all nodes in the network. The new highly adaptive routing procedures made possible by broadcast control is a primary focus of the research. The objec-

tive function for cost optimization in broadcast networks which depends more on the node cost rather than the link cost is being investigated. Exact optimization algorithms for problems in network design are being developed to replace heuristics which were previously required.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0025, DUCTED IONOSPHERIC PROPAGATION
K. Toman, U.S. Dept. of Defense, Air Force, Rome Air Development Center, *Griffiss Air Force Base, Rome, New York* 13441 (DF903780)

Develop techniques for exploiting ionospheric characteristics which give rise to ducted and elevated propagation modes characterized by reduced attenuation. AF function - long-range detection. Deficiency/Opportunity - insufficient knowledge of effects of spatial distribution of ionization of long-range ionospheric ducting. Potential use of HF ducting in ionospheric channels for early warning. How research contributes - these modes may facilitate HF detection and communication over long ranges. Mode reliability considerations will impact on planning the development of conventional and long-range strategic HF radars.

Computer simulation of ionospheric ducting will be combined with radio ray propagation emphasizing the study of the behavior of unconventional, ducted modes. The specification of features characterizing various ionospheric regimes will be extended and refined to assess the likelihood, stability, frequency and elevation-angle characteristics of these modes. Scattering from irregularities will be simulated by introducing deterministic ionosphere scale-size models with a randomly varying component in ray propagation. Concepts will be developed to assess and reduce discrepancies between modelled ionospheres and measured ionospheric characteristics. Validation of simulated radio ray behavior with measurements may be realized. The role of horizontal and vertical refractive index gradients on injection and confinement of rays in ionospheric channels will be assessed.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0026, ESM PROCESSING TECHNIQUES EVALUATION
J. Caschera, U.S. Dept. of Defense, Air Force, Avionics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF097980)

To assess trends in ESM processor technology as they apply to present and future ESM needs and requirements and to devise the criteria and means for evaluating preprocessor/processor configurations developed into hardware.

To generate pulse data digitally in the format outputted by candidate receivers at pulse data rates typical of the environment. This can be done by assembling a number of pulse generating devices and combining their outputs.

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0027, SINGULAR PERTURBATIONS AND ADAPTIVE CONTROL THEORY
A.J. Calise, Drexel University, School of Engineering, *32nd & Chestnut Sts., Philadelphia, Pennsylvania* 19104 (DN775636; N00014-77-C-0642)

Adaptive control theory has been applied to a number of problems in aerospace control systems (auto pilot systems). Future potential applications include control of V/STOL aircraft and variable geometry aircraft where the aircraft parameters vary widely throughout the flight profile. Recently, adaptive control techniques have been used increasingly for industrial process control systems. This task will investigate a new approach to adaptive control design which appears to provide significantly improved transient response, less sensitivity to system parameters and system order reduction for reduced computation.

Research will be performed on the variable structure approach to adaptive control design. Emphasis will be placed on possible variable structure feedback configurations which lead to desirable plant model error performance in the case when only plant outputs are available. Singular perturbation techniques for control system design will also be considered.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0028, EXPERIMENTAL STUDIES OF UNSTEADY FILM COOLING
L.T. Smith, Drexel University, School of Engineering, Dept. of Mechanical Engineering & Mechanics, *32nd & Chestnut Sts., Philadelphia, Pennsylvania* 19104 (ENG77-27946 A02)

This experimental study concerns heat transfer in unsteady film cooling. The experimental facility includes a Ludwieg Tube, an intermittent wind tunnel and a Schlieren system. With this facility, a well-controlled, unsteady, low subsonic main flow and injection flow is being obtained. Emphasis is placed on two areas: (1) study of the mixing process of the injection flow with either a laminar or turbulent boundary-layer flow, and (2) the measurement of the wall heat flux with film cooling and hence the isothermal film-cooling effectiveness. An existing analytical model is being modified to aid in interpreting the experimental results.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0029, SCHEDULING FOR MULTIPROCESSOR SYSTEMS
T.K. Agerwala, University of Texas, Austin Campus, School of Engineering, Dept. of Electrical Engineering, *200 W. 21st, Austin, Texas* 78712

DESCRIPTION: Parallel and vector computer architectures are valuable for applications requiring high throughput on well ordered data such as weather modelling, ballistic missile defense, air traffic control and econometric modelling. The advantage of parallel and vector architectures is the potential increase gained through concurrently executing independent portions of the same program. This work is directed towards the study of effective implementation of scheduling strategies for parallel computer architectures in a three-year program which is in its second year.

Emphasis will be toward bridging the gap between high level languages and various scheduling strategies. Issues such as appropriate data structures and intermediate language constructs which facilitate scheduler implementations will be analyzed.

SUPPORTED BY University of Texas

4.0030, COAXIAL PLASMA GUN STUDY
W.C. Duesterhoef, University of Texas, Austin Campus, School of Engineering, Dept. of Electrical Engineering, *200 W. 21st, Austin, Texas* 78712

DESCRIPTION: Continuation of previous study of coaxial plasma gun to produce high energy stream of plasma for injection into confining magnetic fields for plasma containment studies. Earlier work used hydrogen as gas; for current work interest is in gun characteristics with heavier deuterium and helium as working gases.

Diagnostics include magnetic probes, biased and unbiased electric probes, Faraday cup ion probes, particle energy analyzers, high speed photography, spectral line broadening measurement, and microwave interferometry.

SUPPORTED BY University of Texas

4.0031, PREDICTION OF INTERACTING SUPERSONIC BOUNDARY LAYERS
J.P. Lamb, University of Texas, Austin Campus, School of Engineering, Dept. of Mechanical Engineering, *200 W. 21st, Austin, Texas* 78712

DESCRIPTION: The complex interaction of viscous and inviscid flow components in the supersonic, turbulent regime is being modelled, as a first order approximation, by integral techniques. The particular geometry being considered is a compression corner in planar or axisymmetric flow. The primary objective of the current work is to develop correlations for incipient separation conditions. Available experimental results show con-

tradictory trends and few prediction techniques have been developed.

SUPPORTED BY University of Texas

4.0032, ATMOSPHERIC BOUNDARY LAYER BEHAVIOR IN THE PRE- AND POST-SEVERE CONVECTION PERIODS

G.D. Emmitt, University of Virginia, School of Arts & Sciences, Dept. of Atmospheric Sciences, *Garrett Hall, Charlottesville, Virginia* 22903 (ATM78-20972)

Small-scale variability within the atmospheric boundary layer is an important factor in the evolution of convective storms. Atmospheric boundary layer studies in SESAME (Severe Environmental Storms and Mesoscale Experiment) will contribute to an understanding of the nature, magnitude, and role of small-scale processes in controlling the occurrence of convection. This research employs a tethered balloon sounding system to observe the structure of the atmospheric boundary layer during undisturbed, pre-storm and post-storm periods. Undisturbed studies, emphasizing the structure of low-level wind maxima, are conducted cooperatively with the operations of an acoustic echo supported by a storm scale radiosonde network. In addition, data from the extensive Doppler radar and surface meteorological station networks in SESAME are available to this research. Theoretical studies and descriptions of the structure and evolution of the boundary layer will be conducted in collaboration with other SESAME scientists.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

4.0033, IN-SITU MICROWAVE MEASUREMENTS OF LOSSY DIELECTRICS 15586-GS

R.J. King, University of Wisconsin, Madison Campus, School of Engineering, Dept. of Electrical & Computer Engineering, *Madison, Wisconsin* 53706 (DA0G8911; DAAG29-78-G-0181)

To develop a simple homodyne system for the measurement of the complex dielectric constant of lossy materials at microwave frequencies. Relevance - this work potentially can lead to development of a nondestructive soil moisture measurement system since the dielectric constant of soils varies as a function of moisture content. Soil moisture is a fundamental parameter in hydrologic forecasting and was identified as a needed research area at the recent Military Hydrology Workshop. Wes has further identified this as a possible 'ground truthing' system for remotely sensed (aircraft or satellite) data.

Two techniques will be evaluated. In the first, a wave is propagated at right angles into the medium in which a modulated scatterer has been emplaced, thus allowing measurement of the complex plane wave propagation constant. The second technique involves guiding a transmission line mode along the air-medium interface using a bare ribbon conductor.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel
Development & Readiness Command,
Army Research Office

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, CONTINUATION OF THE OPERATION OF THE IMS ALASKAN CHAIN OF MAGNETOMETERS, ALL-SKY CAMERAS AND RIOMETERS

G.J. Romick, University of Alaska, Fairbanks Campus, Geophysical Inst., *Fairbanks, Alaska* 99701 (ATM78-25479)

The International Magnetospheric Study (IMS) is an international program designed to increase our knowledge of the morphology and dynamics of the plasma surrounding the earth. This program, started in 1976, is scheduled to continue in the data gathering phase through 1979. The United States' participation in the program features satellite transmission of magnetometer and riometer data from remote stations. All-sky cameras also operate at many of these stations. The Geophysical Institute was funded in 1976 to install and operate a chain of high-latitude stations in Alaska and northern Canada. The complete chain has only recently become fully operational and includes Canadian stations at Eureka, Johnson Point, Sachs Harbor, Cape Perry, Inuvik, and Alaskan stations at Arctic Village, Ft. Yukon, Poker Flat, College and Talkeetna.

This grant supplies funding to continue this data-gathering operational program through the end of 1979 with the possible extension into 1980.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

5.0002, MERCURY GEOLOGIC MAPPING

H.E. Holt, U.S. Dept. of the Interior, Geological Survey, Geologic Division, *601 E. Cedar Ave., Flagstaff, Arizona* 86001 (9580-01856)

The overall objective of this project is the publication of a Geologic Atlas of Mercury composed of all or parts of 9 quadrangle maps at a scale of 1:5,000,000. Geologic mapping is based on the photographic data returned by Mariner 10 during its flybys of the planet Mercury in 1974-75. The procedure of analysis involves dividing the surface rocks into geologic units and mapping their distribution. The surface of Mercury records successive events that modified surficial distributions of materials; events resulting from internal processes such as volcanism and tectonism, as well as the external mechanism of meteorite impact. The resulting geologic maps will depict the stratigraphy and structure of the surface materials from which the sequence and nature of the major events that have affected the planetary surface can be recognized. A geologic and tectonic evolution of Mercury will be derived from the resulting geologic mapping.

SUPPORTED BY U.S. Dept. of the Interior, Geological
Survey, Geologic Div.

5.0003, PHOTOGRAMMETRY

S.S. Wu, U.S. Dept. of the Interior, Geological Survey, Astrogeologic Studies Branch, *601 E. Cedar Ave., Flagstaff, Arizona* 86001 (9580-00992)

The objective of the photogrammetry project is to conduct research, develop and apply new photogrammetric technology to specialized spacecraft data reduction problems for the derivation of surface topography, on local and global scales of extraterrestrial planetary bodies. Spacecraft imaging systems include optical, radar wavelength and other remote sensing devices. Research involves development of both hardware and software for photogrammetric plotter systems.

By using their gravity fields, a topographic datum of Mars and the Moon is redefined. By synthesizing imaging and non-imaging data, global maps of Mars and the Moon are to be compiled and continuously enhanced. Using high resolution Viking photographs, detailed topographic contour maps of features of scientific interest on the martian surface will be compiled.

For the Venus mission and other future planetary mission flights, mapping technology using side-looking radar imagery will be developed from the investigation of this project.

SUPPORTED BY U.S. Dept. of the Interior, Geological
Survey, Geologic Div.

5.0004, GEOLOGIC MAPS OF MARS, 1:15 MILLION SCALE

D.H. Scott, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *2255 N. Gemini Dr., Flagstaff, Arizona* 86001 (9580-02365)

This project will be a joint effort between geologists of the U.S. Geological Survey and those from several universities. Initially the geology will be mapped on transparent overlays to Viking orbital photos or subquadrangle photomosaics (scale 1:1.25M and 1:2M). Compilation of data will be made on stable-base cronaflex or cronapaque copies of the 1:15 million scale base map to be provided by the Flagstaff Cartographic Section. The map will consist of 5 sheets (4 Mercator equatorial sheets, 1 polar stereographic sheet including both poles). Geologic map-

ping will be started during October 1978 in the north polar and southwestern equatorial regions.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0005, SEASAT-A SATELLITE - EASTERN PACIFIC TUNA FISHERIES EXPERIMENT

R.M. Laurs, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Marine Fisheries Service, Southwest Fisheries Center, *P.O. Box 271, La Jolla, California* 92037 (SWC-903)

This is a demonstration experiment to evaluate the utility of ocean and weather products derived from SEASAT-A satellite measurements to Eastern Pacific Tuna Fisheries. The original objectives of the Eastern Pacific Tuna Fishery SEASAT-A experiment were to 1) evaluate the reliability of existing FAX products against those from SEASAT-A in assisting U.S. tropical tuna fishermen in making tactical fishing decisions; 2) evaluate the utility of SEASAT-A products in assisting U.S. Albacore fishermen in making tactical fishing decisions; (3) evaluate the potential of SEASAT-A products in providing useful information in managing the tropical tuna and albacore tuna fisheries; and 4) evaluate the usefulness of SEASAT-A products to ongoing research in fishery-oceanography in the Eastern Pacific. Because of the premature failure of the SEASAT-A satellite it is necessary to modify the original experimental design and approach. The modifications are pending and could be firm by mid-January 1979.

SUPPORTED BY U.S. Dept. of Commerce, National Marine Fisheries Service, Southwest Fisheries Center

5.0006, ENGINEERING GEOLOGIC STUDIES OF NATIONAL PETROLEUM RESERVE, ALASKA (NPRA)

R. Kachadoorian, U.S. Dept. of the Interior, Geological Survey, Alaskan Branch of Geology, *345 Middlefield Rd., Menlo Park, California* 94025 (9310-01972)

STATE TO WHICH PROJECT PERTAINS: Alaska.

Make engineering geologic investigations to provide necessary geotechnical analyses needed for petroleum exploration of the National Petroleum Reserve, Alaska. Investigations will include, but not be limited to, a) determining sources of construction material, and b) evaluating site locations of such facilities as airstrips, roads, drill sites, and construction camps.

Consult with participants in the National Petroleum Reserve, Alaska, program on a) engineering geology and permafrost-related engineering problems, and b) engineering geology-related environmental effects of exploration activities in the Reserve.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0007, INTERPRETATION OF SMALL VOLCANIC FEATURES

C.A. Hodges, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *345 Middlefield Rd., Menlo Park, California* 94025 (9580-02356)

Plans for the current fiscal year include extensive literature research; acquisition of terrestrial photographs and maps in areas of specific relevance to Mars (e.g. Iceland, Alaska, Antarctica); review of pertinent LANDSAT imagery; and a systematic survey of Viking mosaics and identification of volcanic provinces and individual features. Progress will be reported at the Planetary Geology Principal Investigators' meeting in June.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0008, LAVA FLOW RHEOLOGY AND MARTIAN VOLCANIC PROCESSES

H.J. Moore, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *345 Middlefield Rd., Menlo Park, California* 94025 (9580-02368)

Several of the older volcanic structures on Mars, such as Hydriaca Patera, will be examined in detail to see if their morphologies and features are consistent with terrestrial volcanoes that have erupted and extruded lava flows. Pictures taken by the Viking Orbiters will continue to be searched for features that resemble the table mountains of Iceland. Estimates of Bingham plastic yield strengths of Martian flows will continue.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0009, FOOTHILLS FAULT SYSTEM OF THE SIERRA NEVADA, CALIFORNIA

D.E. StuartAlexander, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *345 Middlefield Rd., Menlo Park, California* 94025 (9540-02190)

STATE TO WHICH PROJECT PERTAINS: California.

In this fiscal year the lineament studies from LANDSAT, SLAR and U-2 color IR imagery will be completed. Field checking of the lineaments will be started, and in selective areas intensive efforts will be made to establish recency of faulting.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0010, NORTH PACIFIC EXPERIMENT (NORPAX) - REMOTE SOUNDING OF TEMPERATURE OF OCEAN SURFACE IN CLOUDY ATMOSPHERES

M.T. Chahine, U.S. National Aeronautics & Space Admin., Jet Propulsion Lab., *4800 Oak Grove Dr., Pasadena, California* 91103 (OCE78-20991)

The work described in the initial project, OCE74-13738, has been successfully completed. This proposal is requesting 12-months additional support to (1) verify the accuracy of satellite-derived sea surface temperatures and cloud distributions, (2) verify a new approach to measure the temperature gradient in the lowest layer of the atmosphere, and to (3) include the NORPAX requirements in the development of a new high resolution multidetector temperature sounder under development. This work is principally supported by NASA.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Ocean Sciences

5.0011, STUDIES OF THE DYNAMICS OF THE GEOMAGNETIC TAIL AND OF THE GEOMAGNETIC DISTURBANCE FIELD CURRENT SYSTEMS

G.L. Siscoe, University of California, Los Angeles Campus, School of Letters & Science, Dept. of Atmospheric Sciences, *405 Hilgard Ave., Los Angeles, California* 90024 (ATM79-15251)

Two recent, important classes of observations, one showing the presence of large amplitude deformation waves on the boundary of the geomagnetic tail, the other revealing the existence of quasi-permanent patterns of electrical currents linking the magnetosphere and ionosphere, motivated the investigations supported by this grant. The first observation demonstrates the strong mutually interactive nature of the solar wind coupling to the geomagnetic tail, and raises this subject to a level of importance requiring intensive observational and theoretical analysis. This study is directed at documenting the phenomenology of the boundary waves, and their relationship to geomagnetic activity, through the analysis of spacecraft data sets. The analysis is supported by a theoretical effort to investigate the types of boundary waves that can be generated by the various suggested mechanisms relating the dynamics of the tail to magnetospheric storms and substorms.

The second part of the study is an attempt to unify the subject of the geomagnetic signatures of magnetospheric activity, which now is characterized by a diversity of separate signatures each with supposed counterparts in the form of separate physical processes. Unification will be attempted by investigating the variety of signatures that can be produced simply by varying the relative intensities of the structural components of the new, quasi-permanent current system. It is suspected that the putative partial ring current system may be a phantom constructed out of

one of the variety of signatures produced by the quasi-permanent current system. This idea will be explored in more detail.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0012, NORTH PACIFIC EXPERIMENT (NORPAX) - STUDIES OF EQUATORIAL DYNAMICS AND LONG PERIOD TRANSPORT VARIATIONS IN THE CENTRAL PACIFIC

R.A. Knox, University of California, San Diego Campus, Scripps Institution of Oceanography, *P.O. Box 1529, La Jolla, California* 92038 (OCE7823134)

This project is part of the North Pacific Experiment (NORPAX). The long-range goal of NORPAX is to understand fluctuations in the upper layers of the Pacific Ocean with time scales of months to years and space in excess of 1,000 kilometers, and the relationship of these oceanographic fluctuations to the overlying and adjoining atmosphere. Achievement of this goal should eventually lead to improved weather/climate prediction for both the Pacific Ocean and North America.

A major component of NORPAX is a coordinated field program to determine the space and time variability of the density and velocity fields in the upper layers of the Equatorial Pacific current system. This field program will occur between February 1979 and May 1980 and will involve the efforts of a number of scientists. Measurements will be made from ships, airplanes, and moored and drifting instruments.

This grant will provide for current meter measurements from three moorings on or near the equator at about 153 degrees W. Five current meters will be placed in the upper 250m of water on each mooring. The moorings will be deployed in September 1979 and retrieved in January 1980.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Ocean Sciences

5.0013, TROPOSPHERIC SAMPLING

Weickmann, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Lab., *Boulder, Colorado* 80302 (8G130536)

PROJECT OBJECTIVE: Conduct a three to six month pilot project involving a high flying non-pressurized aircraft for the collection of ice crystals and aerosols in anvils of cumulonimbus clouds in Dewar bottles and on filters, and the chemical analysis of the scavenged particles which are attached to these crystals by means of an X-ray emission method. For comparison, particles from non-convective cirrus layers will also be collected and will be analyzed in the same way.

CURRENT YEAR PLAN: Conduct the three to six month pilot project.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Lab.

5.0014, ECHOSONDE COHERENCE AND PHASE STUDIES 15853-GS

E.H. Brown, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Lab., Wave Propagation Lab., *Boulder, Colorado* 80302 (DA0G8975)

To investigate coherent effects in the propagation and scattering of sound in the atmosphere, particularly in relation to mean phase with a view towards remote sensing application for the measurement of atmospheric temperature and wind profiles. Relevance - the development of a simple, inexpensive, and continuous near real-time remote sensor of wind and temperature profiles of the lower atmosphere has a wide range of application: artillery ballistic corrections; transport and diffusion of smoke, dust and chemical agents plumes; high energy and electro-optical sensor atmospheric characterization; fog, ice and precipitation and formation and dissipation; and aircraft operations at airfields.

Theoretical investigation of echosonde mean phase, application of the results to development of an echosonde instrument for remote sensing of wind and temperature profiles, and comparison of acoustic soundings with in-situ wind and temperature measurements at the 300 meter instrumented tower at the Boulder Atmospheric Observatory.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

5.0015, DEVELOPMENT OF HIGH-FREQUENCY ELECTROMAGNETIC TECHNIQUES

R.D. Watts, U.S. Dept. of the Interior, Geological Survey, Geologic Division, *Box 25046, Denver Federal Center, Denver, Colorado* 80225 (9780-01756)

STATES TO WHICH PROJECT PERTAINS. Alaska, Utah, Washington, New Mexico.

Digitization and signal processing of airborne pulse sounding data from the Columbia Glacier will be carried out to produce accurate bottom profiles from the deeper parts of the glacier.

Development of high frequency CW and pulse systems for point-to-point measurements in salt and other high resistivity media will be completed and tests carried out in underground workings and between boreholes. Tests and development of radar systems for borehole measurements will be carried out.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0016, STUDIES IN REMOTE SENSING APPLIED TO GEOCHEMICAL EXPLORATION

F.C. Canney, U.S. Dept. of the Interior, Geological Survey, Geologic Div., Branch of Exploration Research, *Box 25046, Denver Fed. Ctr. Bldg. 25, Denver, Colorado* 80225 (9330-00815)

STATES TO WHICH PROJECT PERTAINS: Maine, Montana and Colorado.

The overall objective of this project is to develop remote-sensing techniques for identifying mineralized areas in regions of heavy vegetation. Vegetation can be used as a link between abnormal chemical conditions in the soil and an aircraft- or spacecraft-mounted sensor for the following reasons: (a) plants generally reflect their geological environment by their distribution patterns and minor-element content; and (b) laboratory and field studies have established that metal stressed and normal vegetation can have subtly different spectral characteristics. Therefore, a geochemical anomaly in a heavily forested area might be detected by spatial and/or spectral changes in the reflection of the vegetation canopy.

To date aerial surveys using color infrared film, multiband photography, and multispectral line scanners, coupled with the simpler interpretative techniques have not been successful in discriminating geochemical anomalies in heavily forested areas. Apparently the reflectance anomaly was totally obscured by variables unrelated to soil geochemistry. However, recent research in cooperation with W. Collins of NASA's Goddard Institute for Space Studies, and using a specially built high resolution airborne spectrometer, suggests that high resolution spectral data, where processed by computerized waveform analysis techniques, can be used to separate vegetation growing over a mineralized zone from background vegetation.

In the current year, additional testing of the instrument and analysis techniques will be done at several mineralized sites of different types.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0017, SEDIMENT MOVEMENT AND CHANNEL CHANGES IN RIVERS

R.H. Meade, U.S. Dept. of the Interior, Geological Survey, Water Resources Div., *Bldg. 53 Denver Federal Ctr., Mail Stop 415 Box 25046, Lakewood, Colorado* 80225 (CR 75-102)

Sediment moves through river systems in response to specific events and changing conditions in drainage basins. These events and conditions are both natural (floods, climate changes) and artificially-induced (accelerated erosion, reservoirs, diver-

sions, channelizations). The response often takes place over periods measurable in decades or longer. The morphology of the river channels changes as sediment moves through the system.

To assess: (1) changes in river sediment loads over periods of decades or longer, and the factors (natural and artificial) that cause the changes; (2) rates at which rivers change their courses, shapes, and other morphologic features, both in their natural state and in response to artificial influences; (3) effects of infrequent catastrophic events or large-scale human influences on the 'equilibrium' sediment movement and channel morphology in rivers; (4) sources, pathways, and sinks of sediment in rivers.

Basically an historical approach, using available records and making some first-hand field studies. Records will include sediment-load data previously collected by USGS and other agencies; changes in channel morphology will be interpreted by comparing old and new maps plus available aerial photographs of selected rivers in the Upper Missouri Basin. Field studies will include repeated surveys of selected channels and tracer studies of sediment movement.

Daily sediment loads measured on Amazon River ranged from near 10**6 tons per day at Iquitos, Peru, to 3x10**6 tons per day at Obidos, Brazil. Effects of reservoirs on downstream sediment loads in Bighorn River are mixed: one reservoir definitely reduced loads downstream, another shows no discernible effect on sediment loads 200 km downstream after 12 years.

(1) Continue long-term field measurements of channel changes in East Fork River, Wyoming, and Powder River, Montana. (2) Complete analysis of data on sediment loads and hydraulic geometry of Amazon River. (3) Continue analyses of effects of reservoirs on downstream sediment loads and channel geometries.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Water Resources Div.

5.0018 JOINT UNIVERSITY OF COSTA RICA - UNIVERSITY OF DELAWARE MARINE STUDIES PROGRAM

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OBJECTIVES: (1) To initiate a well planned joint UCR-UD preliminary ecological assessment of commercial and megabenthic invertebrates of Golfo de Nicoya and begin to compile a solid knowledge base about Costa Rica's marine resources. (2) To provide a well equipped, modern, versatile and economical research vessel as a platform from which to do research which can also be used by UCR as a training platform for research vessel crews, oceanographic technicians and marine studies students at graduate and undergraduate levels. (3) To initiate a joint UCR-UD study of current circulation, pollutant dispersion and land use changes, using inexpensive remote sensing techniques. (4) To continue the exchange of personnel between UCR and UD, especially for graduate and technician training. (5) To provide UD as a model, based on its Sea Grant College and University National Oceanographic Laboratory System (UNOLS) status, as one approach to developing marine studies expertise and capability in an academic institution.

ANTICIPATED BENEFITS: (1) Training of 2 UCR research vessel crews and 8-10 oceanographic technicians. (2) Provide information to assess pollutional impacts in the Golfo de Nicoya. (3) Provide training on remote sensing of coastal processes and new information on the current circulation, pollutant dispersion and land use in and around de Golfo de Nicoya. (4) Provide research vessel as platform for UCR to conduct research and train students who are on their way to becoming professional marine scientists.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Sea Grant Office

5.0019, PREPARATION AND DISTRIBUTION OF THE 1975-1979 U.S. NATIONAL REPORT TO THE INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS

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The various national committees to the International Union of Geodesy and Geophysics (IUGG) prepare reports on research performed in their countries and present these reports to the IUGG at its general assembly. The reports of the U.S. National Committee have been such valuable summaries of progress and bibliographic resources that the U.S. has continued to prepare them even though they are not required by IUGG. The 1975-1978 Report of the U.S. National Committee is to be published through an arrangement with the American Geophysical Union as four special issues (totalling approximately 1100 printed pages) of its journal Reviews of Geophysics and Space Physics. Thus the Report will receive wide visibility and use and can be properly archived and referenced. The Report comprises over 100 individual review articles with extensive bibliographics, each covering a specific subdisciplinary area of geophysics. As critical reviews of progress of U.S. research during the preceding four years, the Report is more than a monument to U.S. efforts and successes. Its extensive bibliographies are effective sources for specialists in a field to assess the current literature; for students to have a broad exposure to the full range of current geophysical activity in the U.S.; and for the researchers moving into new areas to place their own work in perspective.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Earth Sciences

5.0020, DISTRIBUTION OF SUBMERGED AQUATIC VASCULAR PLANTS IN CHESAPEAKE BAY, MARYLAND

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The proposed work has two objectives: 1. assess usefulness of archival remote sensing data for determining trends in distribution of submerged plants in Chesapeake Bay; and 2. produce distribution maps of submerged plants in Chesapeake Bay using aerial photography and field work as data sources. With regard to objective (1), the photographic data banks of government agencies and private flying companies will be searched for useful photography. It is anticipated that from 30 to 40 years of data are available over some areas of the Bay. Selected areas, depending on availability of data, will be studied intensively. The final product will be estimates of trends in SAV populations over time spans covered by the photographic data. With regard to the second objective, the aircraft photography and field data will be used to produce distribution maps inked on 1:24,000 U.S.G.S. quad sheets. The mapping project area includes 77 quad sheets which cover the Maryland waters of the Chesapeake Bay and tributaries.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Gulf Breeze Environmental Research Lab.

5.0021, NORSEX EXPERIMENT

J.P. Hollinger, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN980132)

To investigate the coastal current flowing northbound off the Norwegian coast, creating an oceanic front, and the influence of fresh or brackish water flowing out of the fjords, especially in the spring. A correlative objective is to detemine the accuracy and utility of airborne remote microwave sensors to map currents and mass water movements on an all-weather basis.

To utilize the full complement of sensors, including active and passive microwave, laser, thermal infrared thermometer, environmental and air-lauched AXBTs and dropsondes aboard the NRL RP 3-A aircraft to measure the atmosphere and ocean surface off the Norwegian coast during NORSEX in March, 1979.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0022, CONTINUOUS OPERATION OF THE FRENCH METEOR RADAR ON PUERTO RICO, 1979-1980

R.G. Roper, Georgia Inst. of Technology, School of Geophysical Sciences, Dept. of Aerospace Engineering & Geophysical Sciences, *Atlanta, Georgia* 30332 (ATM78-10089 A01)

We are growing increasingly aware of a variety of important roles, in upper atmospheric physics, played by tidal motions. While such motions are difficult to measure, two techniques have significantly extended our knowledge for localized studies: incoherent scatter (I.S.) radars and meteor wind radars. The meteor wind radars are far less expensive, and provide valuable data in the 80-100 km range. An array of such meteor wind radars have (in conjunction with I.S. radars) provided valuable guidance in determining which tidal modes of atmospheric oscillation dominate in the middle latitude upper atmosphere. Very little data is available for lower latitudes, and interpretations are conflicting for this part of the globe.

This grant provides for operation of a meteor wind radar at a low latitude location to more globally extend understanding of winds and tidal oscillations in the mesopause region. The data produced will significantly extend our knowledge of mesopheric dynamics. Specifically, the location chosen is near Arecibo. There the continuous meteor wind radar data, in combination with the much more sporadic, but much more detailed and complete I.S. radar data, will allow much more definitive studies than otherwise possible.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

5.0023, EFFECTS OF MINING AND LAND RECLAMATION ON HYDROLOGY OF SOUTHEASTERN KANSAS

A.M. Diaz, U.S. Dept. of the Interior, Geological Survey, Water Resources Div., *Lawrence, Kansas* 66044 (KS 77-081)

Effects of past and present mining of coal, lead, and zinc in southeastern Kansas have caused degradation of streams draining the mined areas. Quantitative measures of the degradation and identification of source areas are needed to assess the effectiveness of pollution-control measures, the possible need for changes in mining and reclamation procedures, and design of a long-term quality-monitoring network in southeastern Kansas.

The objectives of this project are to apply the extensive water-quality data being collected in Project KS 76-076 and remotely sensed data from aircraft and LANDSAT to (1) identification from computer-enhanced imagery of point-source areas where poor-quality water discharges from old shaft mines, strip pits, collapsed areas, spoil embankments, and reclaimed areas, (2) evaluation of land-reclamation effects on water quality by analyzing areal and temporal changes in vegetative vigor in reclaimed areas, (3) establishment of a continuing monitoring program using computer-enhanced imagery to detect anomalies associated with acid drainage, and (4) use of results from above activities to design an improved long-term water-quality-sampling network for the mining area in southeastern Kansas.

Remote-sensing techniques will be used to obtain data for analysis with signal-enhancement systems and digital densitometers to discriminate differences in water quality, degrees of vegetative vigor, and 'hot spots' in mined areas vs. natural areas. The analyses will aid identification of sources of stream-quality degradation related to drainage from shaft mines, stripped areas, collapsed underground workings, and coal-processing activities. Photography and imagery will be obtained repetitively from aircraft and, as appropriate, from LANDSAT for comparison to water-quality data from Project KS 76-076. Additional ground-truth data will be collected in anomolous areas identified from the remotely sensed data. Finally, the data will be used to design a long-term quality-monitoring network in southeastern Kansas.

Multispectral-remote sensing data were obtained by the contractor, Daedalus Enterprises. Concomitant ground-level data were obtained from field measurements and chemical analyses of water samples from 30 sites in Cherry Creek. Preliminary review and analysis was begun for the remote sensing data. (Text Abridged)

SUPPORTED BY U.S. Dept. of the Interior, Geological
Survey, Water Resources Div.

5.0024, QUALITY OF WATER AND FLUVIAL SEDIMENT IN STREAMS DRAINING AREAS MINED FOR COAL, LEAD, AND ZINC IN SOUTHEASTERN KANSAS

A.M. Diaz, U.S. Dept. of the Interior, Geological Survey, Water Resources Div., *Lawrence, Kansas* 66044 (KS 76-076)

The Kansas Department of Health and Environment needs (1) benchmark or baseline information on flow and current water-quality characteristics of streams draining areas in southeastern Kansas that have been deep-shaft and strip mined for coal, lead, and zinc; (2) an evaluation of water-quality degradation associated with the mining and with land-reclamation activities; and (3) an evaluation of the effects of implementing state and federal regulations of mining activities on water-quality degradation in areas that will be mined in the future.

The objective of this study is to provide the data and interpretive evaluations needed to define the water-quality characteristics and the water, chemical, and sediment discharge of streams draining areas mined for coal, lead, and zinc in southeastern Kansas.

Water-quality data from an intensive reconnaissance of streams draining areas mined for coal, lead, and zinc in southeastern Kansas will be evaluated for use in designing a comprehensive study of water and sediment quality and determining the water, chemical, and sediment discharge from the mined areas. The comprehensive study will include the establishment of gauging stations on selected streams and the periodic collection and analysis of water and sediment samples to determine the principal chemical and biological constituents, trace elements, and physical characteristics. Analyses of the water-sediment mixture will include the determination of nitrogen and phosphorus species, total organic carbon, chemical oxygen demand, pesticides, and herbicides. Analyses of sediment will include suspended sediment concentration and particle size and particle size of bed material.

Streamflow and water-quality data collection continued as scheduled at 18 sites in the project area. Field activities were coordinated with projects KS 77-081 (remote sensing) for collection of ground-truth data at about 30 sites in the Cherry Creek basin. Rating curves for streamflow and chemical parameters were developed from available data. Results from statistical analysis of the data indicate a high degree of correlation between major chemical parameters and specific conductance or streamflow. Because of this, the sampling program for the project has been realigned to include a reduced frequency of sampling for the third year of the project.

Continue data collection at selected sites. Complete data analysis and interpretation. Prepare final report.

SUPPORTED BY U.S. Dept. of the Interior, Geological
Survey, Water Resources Div.

5.0025, THE CV-990 MULTI-SPECTRAL SCANNING RADIOMETER (MSR) MEASUREMENT PROGRAM FOR MONEX

W.L. Smith, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Environmental Satellite Service, *Suitland, Maryland* 20233 (ATM79-00547)

The objective of this project is to operate and collect observations from a multi-spectral scanning radiometer (MSR) on board a research aircraft (the NASA CV-990) during the summer Monsoon Experiment (MONEX). The MSR measures shortwave (solar) and longwave (earth) radiation. Estimates of radiative fluxes, surface temperature (sea and land), vertically integrated water vapor profiles, cloud heights and temperature profiles are some of the products of these measurements. They will serve as 'ground' truth and 'fillers' for the broader scale satellite-based measurements that cover the entire MONEX region on a regular and frequent time-scale.

These data will be used by MONEX scientists in conjunction with complimentary MONEX data to study the large scale monsoon heat sources and sinks.

MONEX is a major study to increase our knowledge and understanding of the dynamics and thermodynamics of the atmosphere and ocean in monsoon regions. Three research areas have been identified for this experiment. They are the Arabian Sea, the Bay of Bengal, and Indonesia-Malaysia. This research concentrates on the first of these areas. MONEX is important scientifically and also has significance for global agriculture, economics and politics. The initiative for MONEX is from the

government of India with the USSR and USA playing major roles. In addition to the benefits mentioned above, MONEX offers an excellent opportunity for scientific and technical cooperation between, and of mutual benefit to, the U.S., India and the USSR.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0026, AN ASSESSMENT OF REFRACTION ERROR AND DEVELOPMEMT OF METHODS TO REMOVE ITS INFLUENCE FROM GEODETIC LEVELING

S.R. Holdahl, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Ocean Survey, *6001 Executive Blvd., Rockville, Maryland* 20852

STATE TO WHICH PROJECT PERTAINS: Maryland.

The duration of the project is to be one year. The objective is to develop an algorithm for estimating the vertical temperature profile which is needed for Kukkamaki's refraction correction for leveling. The algorithm will construct the profile using solar radiation data historically observed by the National Weather Service. The model will be tested by comparing predicted solar radiation and temperature profiles with observed values obtained at several weather stations in the U.S.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0027, TERMINAL WEATHER PREDICTION - MEDIUM-RANGE AVIATION FORECASTING

K.F. Hebenstreit, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Weather Service, Systems Development Office, Techniques Development Laboratory, *8060 13th St., Silver Spring, Maryland* 20910 (8D590502)

OBJECTIVE: To develop and implement operationally techniques to: (1) forecast weather elements required in the terminal forecast for projections in the range from 6- to 72-h, (2) organize this weather information for transmission on the National Distribution Circuit (NDC), and (3) automate the packaging of this weather information in appropriate product formats.

APPROACH: Derive forecast equations using the output parameters of operational numerical models, surface observations, appropriate geoclimatic constants, and other available information such as meteorological satelllite data. Investigate and select for operational implementation statistical models which capture the maximum amount of predictive information from the historical data. Tailor organization of the weather forecast information for efficient transmission and optimal applications programming.

PROGRESS: Forecast equations for cloud amount, ceiling, and visibility for both early and final guidance are operational for contiguous states. Development testing of equations for these elements for Alaska is now in progress.

SUPPORTED BY U.S. Dept. of Commerce, National Weather Service, Systems Development Office

5.0028, PROJECT ASH CAN

S.J. Falkowski, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (6542)

The objective is to document the concentrations of selected aerosols and gases in the stratosphere as a function of latitude, altitude and season in the northern hemisphere. Balloon-borne particulate and gas samplers are flown to altitudes of 70,000, 80,000, and 90,000 feet from Alaska and Panama annually and from New Mexico seasonally except winter. Schedules are coordinated with Project Airstream, the aircraft-borne sampling program, which together with Project Ash Can, constitutes the DOE High Altitude Sampling Program. Filter papers are sent to the DOE Environmental Measurements Laboratory for analysis of particulate radioactivity. Exposed molecular sieve is analyzed at Argonne National Laboratory. Interpretative analysis of data is by EML and the Air Resources Laboratory, NOAA.

SUPPORTED BY U.S. Dept. of Energy, Office of Health & Environmental Research

5.0029, AIRCRAFT DATA COLLECTION AND ANALYSIS FOR CORRELATION WITH THE COASTAL ZONE COLOR SCANNER

F. Polcyn, Environmental Research Inst. of Michigan, *P.O. Box 8618, Ann Arbor, Michigan* 48107 (7-723; 03-8-A01-4299)

OBJECTIVE: Through combined empirical and theoretical approaches analyze calibrated narrow band multispectral scanner data acquired over various natural waters in the Gulf of Mexico to support the validation of Nimbus-G Coastal Zone Color Scanner (CZCS) data for the quantification of total phytoplankton pigments, and total suspended particulate concentrations.

APPROACH: (a) collect calibrated multispectral scanner data in the Gulf of Mexico with the ERIM M-7 narrow band module scanner; (b) provide absolute radiometeric calibration of the scanner system by ground measurements of system response characteristics before and after acquisition of ocean radiance data; (c) reduce the aircraft multispectral scanner data to equivalent zero altitude radiances for comparison with shipboard measurements and with NOAA calculations of atmospherically corrected CZCS data; (d) using the radiance data collected by the M-7, scan spatially simulated data to determine the effects of the averaging process inherent in the resolution of the CZCS and LANDSAT multispectral scanner systems; (e) prepare output products (using CZCS algorithms and algorithms developed in the New York Bight studies) giving the distribution of total suspended particulates and total phytoplankton pigments as determined both by the M-7 scanner and the CZCS; and (f) evaluate second derivative method as applied to raw CZCS data without atmospheric corrections.

CURRENT PLANS: Present plans are to conduct a major multi-unit and interdisciplinary experiment in the Gulf of Mexico during November, 1978. Participating in this effort will be science personnel onboard the RV Athena and the Texas A & M Gyre to acquire atmospheric and oceanic optical measurements. In addition, the Gulf test sites will be overflown by the NASA/AMES U-7 carrying the NASA/Goddard Ocean Color Scanner (OCS), and the ERIM Haviland C-7 aircraft carrying the narrow band M-7 module scanner. Information obtained will provide input to CZCS data validation and algorithm development for generating "derived" output products.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Environmental Satellite Service

5.0030, SEASAT PROGRAM - BATHYMETRY AND BOTTOM TOPOGRAPHY MAPPING

R.A. Schuchman, Environmental Research Inst. of Michigan, Radar & Optics Division, *P.O. Box 8618, Ann Arbor, Michigan* 48107 (7-978; MO-AO1-78-00-4339)

OBJECTIVE: The investigation is concerned with the application of the SEASAT Synthetic Aperture Radar (SAR) to measure ocean wavelengths undergoing wave refraction and relating these changes to the presence of islands, shoals, and water depth.

APPROACH: Examine SEASAT SAR data collected over the Gulf of Alaska and select an SAR pass that has noticeable wave refraction present. The radar-equipped Canadian Convair 580 aircraft will also collect data over the Gulf of Alaska test site. A clear water test site in the Carribean will be selected for targets of opportunity. Selected portions of two acquired SEASAT passes will be digitized, and geometry and radiometric distortions in the SEASAT data will be corrected digitally. The data will be reduced into bathymetry maps using an oceanographically acceptable wave refraction model and the results will be compared to all available sea truth. The SAR image output data is to be corrected optically for geometric effects. Image data will be corrected optically to enhance wave trains and obtain spectra at selected locations; these data would then be reduced into a bathymetry map and compared.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Environmental Satellite Service

5.0031, RADAR BACKSCATTER AND OPTICAL REMOTE SENSING STUDIES OF THE IONOSPHERE
A.F. Nagy, University of Michigan, Ann Arbor Campus, School of Literature Science & the Arts, Dept. of Atmospheric & Oceanic Sciences, *Ann Arbor, Michigan* 48104 (ATM7821768)

This grant supports studies of the physics and chemistry of the atmosphere and ionosphere in the following areas: Ionosphere-Plasmasphere Modeling - this numerical model solves the coupled continuity, momentum and energy equation of the major ions along a field line, between magnetically conjugate F region altitudes. Such a model, coupled with observational data from the Atmosphere Explorer satellites and incoherent radar backscatter facilities, will significantly enhance our understanding of ionosphere plasmasphere coupling. Radar Backscatter Spectra due to Non-Maxwellian Ion Velocity Distribution - in the presence of sufficiently large perpendicular electric fields, the ion velocity distribution becomes non-maxwellian. This work will calculate how the radar incoherent scatter spectra is affected by such a distribution, and what the corresponding implications are in the analysis and interpretation of results from high latitude incoherent scatter radar observatories. Airglow Studies - analysis of airglow measurements obtained by satellite, rocket and ground-based observation will continue. One study will analyze and interpret data obtained from combined rocket and satellite observations in order to determine the N2 vibrational temperature and the effects of vibrationally excited N2 on the atmosphere and ionosphere. Airglow equipment currently existing at the University of Michigan will be used to study vibrational excitation sources and sinks of N2 ion, reactions of O ion (2D) with N2, and the morphology of N ion emissions.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0032, THE EFFECT OF COUNTRY DRAINAGE DITCHES ON WATER QUALITY AND QUANTITY IN SOUTH CENTRAL MINNESOTA
H.W. Quade, Mankato State University, School of Arts & Sciences, Dept. of Biology, *P.O. Box 34, Mankato, Minnesota* 56001 (A-040-MINN)

The proposed research plan involves field investigations followed by modeling and computer simulation of water quality as affected by an extensive country drainage ditch system related to agricultural land-use practices.

The first year would involve the following investigations which would aid in site selection for the second year as well as simulation and modeling in the third year: 1) qualitative physiographic drainage analysis of the ditches in relation to ditch sheds and effects on lakes and wetlands (pilot studies presently underway); 2) riparian (green belt) survey of the ditches; 3) aquatic macrobenthos indicator survey (pilot studies done on this); and 4) general land use from aerial surveys, EROS, etc.

The second year would involve selected ditch site data gathering including: 1) water chemistry (pilot study nearing completion); 2) water flow; 3) sediments (suspended and surficial in the ditches); 4) macrophyte survey involving temporal nutrient tie-up and release (pilot study nearing completion); and 5) benthic indicators (pilot studies done).

The third year would involve data processing, the developing of models, and computer simulation of water quality and quantity as a result of the ditches. Both deterministic and stochastic models would be developed. Final write-up and cartography would also be accomplished during the third year.

SUPPORTED BY U.S. Dept. of the Interior, Office of Water Research & Technology

5.0033, LANDSAT CAPABILITIES FOR GENERAL WETLANDS MAPPING
B.O. Benn, U.S. Dept. of Defense, Army, Corps of Engineers, Waterways Experiment Station, *P.O. Box 631, Vicksburg, Mississippi* 39180 (31585)

OBJECTIVE: The overall objective of this study will be to demonstrate the applicability of LANDSAT data to the problem of mapping wetland boundaries and determining general information concerning type and character of wetland areas in the U.S.

APPROACH: A literature review will be conducted to examine previous and ongoing applications of satellite multispectral data to wetlands mapping. Appropriate Corps offices will be contacted to establish the Corps wetland data needs from which classes for mapping will be established. Digital image processing techniques will be screened for potential application by reviewing previous work and consideration of the dynamic spectral and spatial characteristics of wetland and upland vegetation constituents. Image processing techniques selected to have the most potential will be evaluated by applying them to selected test areas in both contract and in-house efforts. Wetlands maps prepared from LANDSAT and thematic type imagery will be compared to established ground-truth data to quantitatively rank the performance of the image processing techniques for mapping the desired wetlands class. Related work currently ongoing at the WES and in support of Corps district or division offices will be an integral part of this study. A report will be prepared documenting the study and providing guidance or use of those procedures deemed to have the most applicability to acquiring wetlands for Corps' purposes. This work addresses mission problem nos. 1-1-2 and 4-1-24.

SUPPORTED BY U.S. Dept. of Defense, Corps of Engineers, Waterways Experiment Station

5.0034, LAND USE MAPPING AND DATA COMPILATION
G.L. Loelkes, U.S. Dept. of the Interior, Geological Survey, Land Information & Analysis Office, Geography Program, *1400 Independence Rd., Mail Stop 821, Rolla, Missouri* 65401 (G-1)

The USGS is planning to complete over 400,000 square miles of land use and land cover mapping for FY-79. The USGS Land Use Mapping Program is an ongoing program to complete land use and land cover maps for the entire nation at a scale of 1:250,000 (1:100,00 in selected areas). These maps will help satisfy a long-standing need for a consistent level of detail, standardization of categories and consistent use of scale of a type of data needed by government planners and managers at national, state and regional levels. Aerial photographs and other remotely sensed data serve as the primary source materials used in compiling the land use and land cover maps.

The land use and land cover maps are complemented by three (in the case of cooperative agreements, four) associated maps at the same scale. These associated maps are: political units, hydrologic units, and census county subdivisions. In the case of cooperative agreements, the fourth associated map is federal land ownership.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Land Information & Analysis Office

5.0035, DEVELOP LASER FLUOROSENSORS FOR MONITORING SURFACE WATERS (ORGANIC CARBON)
M. Bristow, U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Systems Lab., *P.O. Box 15027, Las Vegas, Nevada* 89114 (J884A-057)

OBJECTIVE: Develop an active airborne monitoring system capable of providing quantitative data on the concentration of total organics in surface waters.

APPROACH: The principle employed is an extension of the laboratory technique of spectrofluorometry. Water is irradiated with ultraviolet light of a specific wavelength and intensity. The resultant fluorescence emission is monitored using a monochromator-multichannel detector combination. The fluorescence signal arises from dissolved organic materials. The water Raman emission band is employed as a built-in reference source with which to compare the amplitude of information concerning the concentration of the dissolved organics.

PROGRESS: A firm correlation has been established between dissolved organic carbon (DOC) and normalized fluorescence measurements made on a large number of field samples.

Plans are being made to build an airborne laser fluorosensor based on this principle.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Systems Lab.

5.0036, APPLICATION AND DEMONSTRATION OF MULTISPECTRAL SCANNER (MSS) DIGITAL SYSTEM FOR ENVIRONMENTAL MONITORING

M.R. Dockter, U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Systems Lab., *P.O. Box 15027, Las Vegas, Nevada* 89114 (J884A-043)

OBJECTIVE: Determine feasibility and demonstrate application of aerial multispectral scanning (MSS) for remote sensing of sediment in water, description of land use relationships, and silviculture/agriculture nonpoint sources of pollution. Optimize aerial thermal infrared scanner survey techniques.

APPROACH: Collection of surface and airborne MSS data to study atmospheric attenuation corrections and site-to-site algorithm transferability. Analyze results compared to EPA standard laboratory testing methods.

PROGRESS: Feasibility of airborne MSS system utility for environmental monitoring purposes has been established, and a field applications demonstration of a satellite scanner for an EPA coastal zone study has been completed.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Systems Lab.

5.0037, USE OF REMOTE SENSING TO DETERMINE THE HORIZONTAL DISTRIBUTION OF CHLOROPHYLL AND SURFACE CURRENTS IN LAS VEGAS BAY, LAKE MEAD, NEVADA

J. Deacon, University of Nevada, Las Vegas Campus, School of Arts & Letters, Dept. of Biology, *4505 S. Maryland Parkway, Las Vegas, Nevada* 89154 (R805045-01; J884A-044)

OBJECTIVE: Provide measurements of chlorophyll concentrations in support of an EPA program to develop a laser fluorosensor method for performing the measurements from an airborne platform.

APPROACH: Measurements are made and samples collected from boat at premarked locations coincident with an overflight by the aircraft-borne remote monitor. Samples are analyzed and compared to results from the remote monitor.

PROGRESS: A number of flights have been conducted over Lake Mead and correlations have been observed between the respective data bases.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Systems Lab.

5.0038, AIR-SEA-ICE INTERACTION INVESTIGATIONS WITH X-BAND RADAR

J.A. Warburton, University of Nevada, System Office, Desert Research Inst., *Reno, Nevada* 89507 (DPP78-21718)

An x-band weather radar, now in operation at Palmer Station, Antarctica, will continue to be used during 1979 and the austral summer of 1979-80 in an investigation of the mountain barrier effect on air mass motions, the effects of katabatic and foehn winds on near-shore ice movement and low-level convective elements associated with precipitation. The recorded radar images will also supply 'ground truth' for satellite measurements which are used by other antarctic meteorology projects supported by NSF. In addition, a joint study with the British Survey will be conducted on radar reflectance and precipitation rate relationships in snowfall conditions between Palmer Station Faraday Base. The field work will be concluded at the end of the austral summer of 1979-80 and will be followed by an in-depth analysis of the data obtained and publication of the results of the studies.

Logistics support is required for three scientists to visit Palmer during the austral summer of 1979-80.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Polar Programs

5.0039, CHARACTERIZATION, MEASUREMENT AND MONITORING OCEANOGRAPHIC AND ENVIRONMENTAL DATA ACQUISITION AND MONITORING SYSTEM DEVELOPMENT

D.G. Dimmler, U.S. Dept. of Energy, Brookhaven National Lab., *Upton, New York* 11973 (000920; EY-76-C-02-0016)

This project is concerned with the development of new methods and techniques in systems for large scale, continuous, automated, real-time remote sensing and monitoring of environmental conditions at many locations dispersed over large geographical areas. Special attention is directed toward: (1) assuring the accuracy of data by development or appropriate data verification techniques and instrumentation for filtering, sampling, integration, and averaging of parameters from sensors; (2) techniques and instrumentation for data communications systems which are suitable for transmission of remotely sensed data from, and commands to, remotely located stations; and (3) application of computer techniques for the purposes of automatic, real-time data acquisition, control of remote equipment and sensors, as well as improved data verification in real-time. Techniques for verification and ordering of collected data in real-time are considered to be of crucial importance to improve the data credibility as compared with that obtained from existing non-real-time techniques as well as to reduce the often excessive operating costs associated with traditional manual and semi-automated systems. Real-time, automated remote sensing, data acquisition and monitoring instrumentation systems which satisfy these basic requirements for high quality correlated synoptic data from remotely located stations are essential for large area regional environmental and biological studies related to airborne emission, health and safety monitoring, and physical atmospheric or oceanographic measurements which provide the basis for predictive modeling studies. Essential requirements for such systems are: (1) conservation of power and communication bandwidth for the remote sensing data acquisition and monitoring stations; (2) operation of command-response telemetry; and (3) communication capability between geographically dispersed remote stations and a central command and data acquisition station.

SUPPORTED BY U.S. Dept. of Energy, Office of Health & Environmental Research

5.0040, REMOTE SENSING EXPERIMENTS FOR STUDIES OF THE CHRONOLOGICAL PLACEMENT AND SETTLEMENT PATTERNS OF THE HOPEWELLIAN PEOPLES (ABBREV)

N. Greber, Cleveland Museum of Natural History, *Wade Oval, Univ. Cir., Cleveland, Ohio* 44106 (BNS79-06279)

This grant provides support for systematic surveys within the Liberty and Seip Earthworks--large tripart Hopewell constructions in Ross County, Ohio. These surveys will be the first systematic, large-scale surveys within any large Hopewell earthwork. They will continue the study of Hopewell cultural dynamics which includes the recently completed excavations of the Edwin Harness Mound within the Liberty Earthworks. The results of these excavations reinforced proposed similarities in site morphology and artifact distributions between Seip and Harness. The presently proposed surveys will provide presently unavailable data on the extent and time depth of prehistoric activities within the earthworks, for testing further hypothesized relationships between the sites. Data will also be sought to aid in determining the relationships of these sites to the major Hopewell center at the Hopewell site itself.

The physical constraints on the survey, including the extent and present use of the land areas, require the use of non-destructive survey techniques. Since the success of remote sensing techniques is largely dependent upon local conditions, geophysical remote sensing systems--magnetic, resistivity, and surface radar--will be compared in pilot surveys over known archaeological

features. Other local geological data and all available archaeological data will be integrated with the results of these surveys, to determine the specific areas and the specific combination of survey techniques that are most effective. Small-scale excavations are planned for the recovery from prime areas of in situ materials suitable for radiocarbon dating. All cultural materials recovered will be processed for faunal, floral, and artifactual information which will aid in determining the type of prehistoric activities within the earthquakes.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Biological Behavioral & Social Sciences, Div. of Behavioral & Neural Sciences

5.0041, INVESTIGATIONS OF FERRAR GROUP ROCKS AND MT. EREBUS, SOUTH VICTORIA LAND, ANTARCTICA

P.R. Kyle, Ohio State University, Columbus Campus, Inst. of Polar Studies, *125 S. Oval Dr., Columbus, Ohio* 43210 (DPP77-21590 A01)

The Ohio State University, under continuing Grant DPP77-21590, will map and sample cumulate rocks at the Warren Range and Ferrar Dolerite sills in the Dry Valley area of McMurdo Sound. Samples of Ferrar Group rocks will be examined in detail using electron microprobe analyses of mineral phases and chemical and isotopic analyses of whole rock samples and mineral separates. An objective of this study is to test if assimilation of granite has occurred in Ferrar Dolerite sills and to use these data to evaluate an assimilation model proposed for the Kirkpatrick Basalt and to examine in detail the importance of fractional crystallization. If this model can be demonstrated it may allow a new insight into the composition of the upper mantle along the Transantarctic Mountains during the Jurassic. Mt. Erebus is an active volcano that has had a lava pool in the inner crater for the last several years. The Principal Investigator has been monitoring the eruptive pattern of Mt. Erebus for the past seven years. Research on the crater area of Mt. Erebus will continue to include geologic mapping, geophysics, remote sensing, and laboratory analyses of samples. Results will contribute to an understanding of the geologic and tectonic history of the McMurdo area during post-mid Cenozoic time.

The Ohio State University scientists will do research in Antarctica during the 1979-80 field season.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Polar Programs

5.0042, RELATIONSHIP BETWEEN THE OZONE AND THE STRATOSPHERIC-TROPOSPHERIC CIRCULATION SIMULATED BY THE UCLA GENERAL CIRCULATION MODEL

M.E. Schlesinger, Oregon State Higher Education System, Oregon State University, School of Science, Dept. of Atmospheric Sciences, *126 Agricultural Hall, Corvallis, Oregon* 97331 (ATM7720681)

The objective of this research is the investigation of the relationship between ozone and air motions in the stratosphere and troposphere. In particular, the research is directed toward: (1) determining the relative contributions of the horizontal advection of ozone, the horizontal mass convergence, and the photochemical production and destruction of ozone in maintaining the observed longitudinal relationship between total ozone and the upper tropospheric flow pattern in middle latitudes, and (2) further understanding of the maintenance of the latitudinal distribution of total ozone by the eddy meridional ozone transport in middle latitudes.

To investigate the relationship between ozone and the stratospheric-tropospheric flow requires knowledge of the four-dimensional distributions of both ozone and winds. Since the required data are not available from observations of the real atmosphere, the method of approach employs the January data simulated by the UCLA stratospheric-tropospheric general circulation model. In particular, the method of approach is to construct and analyze longitude-altitude cross-sections of ozone and the dynamical, thermodynamical and photochemical variables, and their time rates of change, at five-hour intervals extending over 60 simulated hours at 50 N latitude, the latitude where the zonal-mean and longitudinal-variation of the simulated total ozone are maximum.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0043, METEOROLOGICAL ANALYSIS FOR THE APPLICATION OF RAPS AQSMS

H.A. Panofsky, Pennsylvania State University, University Park Campus, School of Earth & Mineral Science, Dept. of Meteorology, *116 Deike Bldg., University Park, Pennsylvania* 16802 (R805640; G603A-AB-045)

This proposal consists of 3 parts; all are aimed at air quality modeling dealing with urban problems and are to be verified with observations of T-6 St. Louis experiment (RAPS). In Part I, a simple vertical 2-dimensional atmosphere model will be applied and tested using various formulations of heat flux and mixing coefficients in the boundary layer. Part II will concentrate on the development of the proper lower boundary conditions in urban situations, particularly St. Louis and Los Angeles. A new method will be tested for deriving the correct ground parameters necessary to yield the proper surface energy balance using satellite infrared measurements for these two cities. Surface heat fluxes will be computed and compared with independent estimates. In Part III, the observed distribution of NOx and perhaps CO will be used to test an air quality model developed for Los Angeles, making use of observed temperatures, mixing depths and heat fluxes as well as estimates of these quantities by a quasi-2D horizontal hydrodynamic model.

SUPPORTED BY U.S. Environmental Protection Agency,
Office of Research & Development, Environmental Sciences Research Lab.

5.0044, D-REGION CHEMISTRY AND DYNAMICS

A.J. Ferraro, Pennsylvania State University, University Park Campus, School of Engineering, Dept. of Electrical Engineering, *101 Hammond Bldg., University Park, Pennsylvania* 16802 (ATM7819964)

This grant funds a research program having as its main emphasis theoretical studies supported by D-region controlled experiments utilizing the incoherent scatter, high power h.f. 'heater,' and air-glow facilities at the Arecibo Observatory and the cross-modulation facility of the Ionospheric Research Laboratory. The cross-modulation facility will be operational from University Park, Pennsylvania, as well as transported to Arecibo, Puerto Rico, during their coordinated programs.

The research program concentrates on two specific problem areas. D-Region Electrodynamics: Recent rocket measurements have established the presence of strong vertical electric fields (approximately 1.0 volt/meter) in the D-region. Such data imply the need to examine the role of transport of charged particles as well as the chemistry of this region. A unique technique for monitoring the presence of these fields will be employed, relying upon modulating the vertical current system with an h.f. 'heater' and detecting the reradiated electromagnetic field from this so-called 'ionospheric antenna.' High Power Radio Wave Modification of the Lower Ionosphere: Upon the completion of the new high power h.f. facility at Arecibo by summer 1979, with an effective radiated power of 100 MW, a factor of five or more increase in electron density in the lower ionosphere can undergo significant modification as a result of ion chemistry changes induced by h.f. heating. A number of experiments will be done to study chemical models/rates and magneto-ionic theory.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0045, TEST OF THE LANDSAT-DATA COLLECTION SYSTEM IN THE SUSQUEHANNA RIVER BASIN

J.V. Funt, U.S. Dept. of the Interior, Geological Survey, Water Resources Div., *228 Walnut St., Harrisburg, Pennsylvania* 17108 (PA 73-051)

The potential use of earth orbiting satellite data relay systems for flood warning has not been well explored.

The objective of this project is to test the earth resources technology satellite-data collection system on key stream gages in the Susquehanna River Basin for flood warning.

Four data collection platforms will be field installed on stream gauges in the basin. Data relayed from the gauges will be provided to the Susquehanna River Basin Commission and the National Weather Service's River Forecast Center in Harrisburg.

Data collection platforms were installed at nine gauging stations in the Susquehanna River Basin for relaying data through the GOES satellite. Data collection platforms were operated at four gauging stations in the Susquehanna River Basin using the LANDSAT satellite to relay the data.

The operation of the LANDSAT data collection system will continue. The operation of the GOES data collection system will continue.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Water Resources Div.

5.0046, AIR TRANSPORT OF POLLUTANTS
T.V. Crawford, E.I. du Pont de Nemours & Co. Inc., *P.O. Box A, Aiken, South Carolina* 29801 (672; AT(07-2)-1)

The major objective of the program is to develop (or adapt), test, apply, and validate mathematical models to calculate the transport, diffusion, resuspension, and deposition of atmospheric pollutants released from one or more point sources. Atmospheric transport processes are the primary means by which radionuclides and other pollutants are transported beyond the SRP site boundary. Because SRP is sharing the environment of the southeastern United States with other nuclear facilities, processes that influence the transport of pollutants at distances of 10 to 1000 km are of primary interest. Atmospheric dispersion models will be developed for the SRP site with the cooperation of appropriate modeling efforts at other DOE sites. Meteorological data from an existing instrumented TV tower and seven-tower network will be used to improve knowledge of the transport and diffusion characteristics within the planetary boundary layer. Atmospheric experiments will be planned and executed to test the models for predicting atmospheric dispersion in the SRP environment. Studies will be made of continuous releases from multiple sources and on instantaneous releases from a single point source. The effect of vertical transport, lids, shear, persistence, and low wind speeds on downwind concentrations of pollutants will be studied. Another objective of this program is to combine data generated from the experimental and aircraft programs with data collected under several other programs at the Savannah River Laboratory. The combined data base will be used to validate models which are used to calculate environmental effects of routine releases to the atmosphere and possible accidental releases.

SUPPORTED BY U.S. Dept. of Energy, Office of Health & Environmental Research

5.0047, CONTINUOUS MONITORS FOR EFFLUENTS
W.W. Pitt, U.S. Dept. of Energy, Oak Ridge National Lab., *P.O. Box X, Oak Ridge Operations Office, Oak Ridge, Tennessee* 37830 (001609; W-7405-ENG-26)

The objective is the development of: (1) automated analytical systems for isolation and identification of specific pollutants; and (2) systems for continuous on-site monitoring of pollutants and health hazards. A three-pronged approach is being taken: (1) detailed characterization studies of specific effluents; (2) adaptation of existing detectors for use as environmental monitors; and (3) identification and conceptualization of new monitors for pollution detection and measurement. A prototype aquatic environmental monitor which continuously measures native fluorescence and the chemical oxygen demand has been assembled and installed for use in monitoring the treated wastewater from coal liquefaction tests. A prototype, portable remote sensing device for detecting fugitive emissions and spills containing polynuclear aromatic hydrocarbons has been assembled and is undergoing evaluation.

SUPPORTED BY U.S. Dept. of Energy, Office of Health & Environmental Research

5.0048, SOLAR RADIATION INTENSITY STUDIES
N.K. Wagner, University of Texas, Austin Campus, School of Engineering, Dept. of Civil Engineering, *200 W. 21st, Austin, Texas* 78712

DESCRIPTION: Two years of hourly solar radiation data gathered at each of four sites near Houston, Texas have been obtained from Houston Lighting and Power. These data will be correlated with independently obtained standard meteorological data. The objective is to provide a technique for estimating available solar energy from standard meteorological observations (which are abundant) for locations where solar intensity observations are not available. The work will be completed in this second year of the effort.

SUPPORTED BY University of Texas

5.0049, CRYSTALLIZATION OF PYROXENES AND PYROXENE-BEARING ROCKS
J.S. Huebner, U.S. Dept. of the Interior, Geological Survey, *12201 Sunrise Valley Dr., MS 912, Reston, Virginia* 22092 (EAR79-08505)

This is a continuation of work previously funded by NASA but transferred to NSF. Work will continue on the phase relations and physical properties of pyroxenes, and to apply the results to problems in lunar and terrestrial petrogenesis, using a combination of optical and microprobe-chemical analyses, X-ray and electron diffraction, and experimental petrology. The basic goal is to create an essential data base for investigators of planetary magma genesis and metamorphism.

Major activities include experimental efforts to measure the rates of Ca, Mg, and Fe diffusion in pyroxenes; the mathematical modelling of pyroxene and olivine diffusion processes in lunar basalt 77115 and the growth of augite exsolution lamellae in noritic breccia 77215; the description of phase relations in the model basalt system CaO-MgO-SiO2-plagioclase; and the partitioning of chromium between silicate crystals and melts at 10-30 kbar.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Earth Sciences

5.0050, REMOTE SENSING AND ECOLOGICAL RESEARCH IN WETLANDS
V.P. Carter, U.S. Dept. of the Interior, Geological Survey, Water Resources Div., *12201 Sunrise Valley Dr., Reston, Virginia* 22092 (NR 73-090)

Wetlands are poorly understood, hydrologically controlled environments. They are essential elements in estuarine, marine, lacustrine, and riverine productivity. Information on: (1) wetland hydrologic variables and their relation to wetland vegetation, (2) wetland dynamics and boundary fluctuations, (3) short- and long-term temporal changes and, (4) other ecological aspects as needed to improve our understanding of these ecosystems and to aid in classification and mapping. Wetland plants may serve as sensitive hydrologic indicators giving information on water (oxygen) stress or water quality parameters such as salinity, turbidity, pH, nutrients, or the presence of various pollutants.

To determine the spectral characteristics of wetland vegetation and relate these to interpretation of remotely-sensed data. To develop improved methodology for mapping and classifying coastal and inland wetlands in cooperation with other interested government agencies and non-government groups or individuals. To examine seasonal and long-term changes in wetland ecology as related to changes in environmental parameters including hydrology, water quality, and land use. To assist with interdisciplinary studies requiring biological research and remote sensing such as the Potomac Estuary Study. To aid in the development of models that utilize remote sensing data as part of the prime data base.

Develop cooperative research projects. Cooperators include WRD Districts, TVA, Topography Division (USGS), USFWS, NASA, JPL, interested state agencies and local groups, and others. Work with all types of remotely-sensed data and available types of analysis equipment in order to achieve the best possible results in a variety of wetland studies. Assist in interdisci-

plinary studies by providing biological and remote sensing information that can be related to study objectives.

(1) Cooperative inland wetlands project with the Topography Division completed and final report prepared. (2) Cooperative project with TVA -mapping should be complete by December 1977, wetland classification system for Tennessee Valley Region is in preparation. (3) Dismal Swamp project - 1:100,000 vegetative map completed; 33 observation wells, 8 staff gauges and 35 temporary benchmarks have been installed. Preliminary report has been started. (Text Abridged)

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Water Resources Div.

5.0051, HYDROLOGIC INTERPRETATIONS BASED ON HEAT-FLUX ANALYSES AND THE APPLICATION OF REMOTELY SENSED INFORMATION

E.J. Plutkowski, U.S. Dept. of the Interior, Geological Survey, Water Resources Div., *12201 Sunrise Valley Dr., Reston, Virginia* 22092 (NR 70-048)

Aside from thermal loading stemming from powerplant operations, little has been done to assess man's influence on the thermal patterns of natural streams. Near stream environmental changes due to man's activities may adversely impact stream ecology by altering stream temperatures. In addition to stream-temperature problems, evaluation of remote sensing instrumentation as a method of detecting sources of thermal pollution, sedimentation, and erosion in large water bodies as well as current circulation has obvious application to a wide variety of hydrologic problems. (A) To isolate and evaluate the effect of man-imposed changes on stream-temperature patterns; (B) identify stream-temperature patterns under a variety of climatic regimes; (C) to assess near shore current patterns in Lake Ontario using turbidity plumes as tracers; (D) to evaluate the utility of the LANDSAT III thermal imager as a means of detecting thermal plumes in the lake; and (E) to continue work in defining the utility of remotely sensed land-use information as a means of improving streamflow estimates.

Pairs of water-courses consisting of a 'control' stream (one under essentially natural conditions) and one or more streams that have been altered by man's activities have been instrumented in selected basins of the northeast U.S. Comparisons of 'altered' stream and its control should reveal the effects of environmental changes on water-temperature patterns. High-altitude photographs and LANDSAT imagery will be used to detect transitory hydrologic phenomena such as heat and turbidity plumes, shoreline erosion, and ground-water inflow to streams.

Cooling water discharge at the rate of 30 cubic meters per second and flowing as a surface jet orthogonal to the shoreline produced a thermal plume in Lake Ontario that extended 1km off shore and was 2km in width in August 1978. The thermal plume created by the power plant located 19 miles northeast of Rochester, N.Y., changes shape rapidly in response to wind speed and direction. It is anticipated that the 19 degrees C rise in temperature above ambient lake levels created by the heated power plant discharge will be detectable by the HCMM satellite.

To continue field operations at the Ginna power plant for the purpose of detailing both thermal and turbidity plume dynamics under a variety of seasonal conditions. (Text Abridged)

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Water Resources Div.

5.0052, NE REGIONAL OXIDANT STUDY - AIRCRAFT MEASUREMENTS OF AIR QUALITY AND METEOROLOGICAL PARAMETERS

J. Gregory, U.S. National Aeronautics & Space Admin., Langley Research Center, *Hampton, Virginia* 23665 (D9-F0758; G603A-AD-040)

OBJECTIVE: The objective of this task is to obtain continuous measurements of O3, NOx, NO, CN, temperature, dewpoint, and air speed during a two-week period from July 31 to August 14, 1979.

APPROACH: The measurements will be made from an instrumented aircraft provided by the Langley Research Center.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab.

5.0053, DETERMINATION OF TERRESTRIAL AGES OF ANTARCTIC METEORITES

J.C. Evans, Battelle Memorial Inst., *P.O. Box 999, Richland, Washington* 99352 (DPP78-24012)

The Battelle Memorial Institute, Pacific Northwest Laboratories, will carry out determinations of the terrestrial ages of antarctic meteorites. Terrestrial ages are the lengths of time since meteorites have entered the earth's atmosphere and have been resting on the surface of the earth. In the cases of the meteorites to be analyzed for terrestrial ages, they fell on the East Antarctic Ice Sheet and have subsequently been riding passively on or in the ice sheet as it flows slowly away from the centers of ice accumulation. Terrestrial ages give minimum ages for the existence of the ice sheet, and glaciologists will be able to use terrestrial ages for other interpretations of ice sheet history. Non-destructive analyses will be made on a large number of the antarctic meteorites now available for research, for such radioactive isotopes as 53Mn, 40K, 238U, and 232Th. These data will also be of use in studying the pre-terrestrial history of the meteorites and the history of the radiation flux of the Sun.

No antarctic field work is planned under this grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Polar Programs

5.0054, GLACIOLOGY--WATER, ICE, AND ENERGY BALANCE OF SNOW AND GLACIERS, AND SNOW AND ICE PHYSICS

M.F. Meier, U.S. Dept. of the Interior, Geological Survey, Water Resources Div., *Tacoma, Washington* (WR 57-077)

Much of the nation's streamflow and soil moisture recharge are provided by snowmelt, and snow can be measured and managed for hydrologic purposes. Yet snow is highly variable in space and time, and no method yet exists for synoptic monitoring of areal extent. Glaciers are sensitive indicators of climate trends, have significant regulating effects on streamflow, may produce outburst floods and other hazards, and are useful analogs to several important geophysical processes. Yet glacier heat and mass balances cannot be quantitatively related to meteorologic parameters, the flow and storage of water in ice is poorly understood, and the englacial and subglacial environment presents severe measurement difficulties.

Develop methods for synoptic monitoring of snowcover, obtain understanding of how meteorological processes determine snow accumulation and melt, and develop improved techniques for predicting snow mass, distribution, and snowmelt runoff using conventional weather data. Determine how meteorological processes affected glacier mass balances, and how changes in mass balance affect glacier motion, glacier variations, and runoff from glaciers; use this knowledge and glacier variation data to construct climatic histories. Measure and develop an understanding of the physics of water flow through ice and at the ice/rock interface and determine how this affects glacier sliding. Understand why certain glaciers behave in anomalous ways (surges, calving retreats) and use this knowledge to minimize economic hardship in dangerous glacier situations.

Investigate the feasibility of using satellites and other remote sensing techniques for the measurement of mountain snow (extent, thickness, mass, and liquid water content). By operating a high-mountain field data network, attempt to relate snow changes to meteorologic elements. Develop numerical models relating water storage as snow to meteorologic input and runoff/evaporation output. Relate glacier mass balance at a field station to meteorological elements, and long-term changes in balance to runoff and ice flow. Use the resulting understanding to analyze variations of other glaciers in terms of climate. Measure water pressure and flow in, within, and out from various levels in and under a glacier, relate water movement to thermodynamics, hydraulics, and rheology of the local ice envi-

ronment, and relate water pressure and thickness to rate of glacier sliding. (Text Abridged)

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Water Resources Div.

5.0055, COLUMBIA GLACIER

M.F. Meier, U.S. Dept. of the Interior, Geological Survey, Water Resources Div., *Tacoma, Washington* (WR 77-158)

Recent work by Austin Post indicates that calving glaciers may become unstable and retreat very rapidly, causing a great increase in the discharge of icebergs. Columbia Glacier is the only calving glacier in Alaska which has not yet made such a rapid retreat in Neoglacial or modern time. Indications exist which suggest that such a retreat may be imminent. The increased discharge of icebergs drifting into Valdez Arm might cause accidents to or interruptions of the movement of tankers carrying oil from Valdez.

Determine the probability that Columbia Glacier will go into a rapid retreat mode in the next few years, and if so, predict the approximate iceberg discharge.

Determine the stability of the present terminus by hydrographic studies, photogrammetry, and glacier flow studies, with special reference to the configuration and effect of the moraine shoal. Extend these studies to other calving glaciers to determine a calving law. Measure iceberg sizes, numbers, and drift trajectories and wind stress. Determine annual mass balance and discharge of the Columbia Glacier system. Use these data in numerical models to determine probable future behavior of terminus and iceberg flux. Conduct a sensitivity analysis of these results.

Hydrographic and sub-bottom surveys were conducted, and wind and wave data obtained, in and near Columbia Bay. The geodetic survey net was extended. Ice-velocity data were derived from air photography. Balance, motion, and thickness change were measured at 62 locations along the length of the glacier. Radioecho sounder design for airborne use has begun. Numerical models were investigated and some preliminary runs made. The glacier continues to thin near the terminus, and a very large embayment formed in 1977. The stability of the terminus appears to be precarious.

Complete project, except for final numerical anaylsis and report writing.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Water Resources Div.

5.0056, NAVY ENVIRONMENT - ANALYSIS OF SEASAT-A SAR IMAGERY

D.A. Rothrock, University of Washington, Div. of Marine Resources, Polar Science Center, *Seattle, Washington* 98105 (DN975357; N00014-79-C-0418)

The objective of this effort is to analyze synthetic aperture radar (SAR) imagery of arctic sea ice obtained from SEASAT-A to obtain measurements of sea ice displacement versus distance along an axis 500 to 800 km long. These data will contribute to understanding how the distribution of ice thickness is changed by deformation.

Successive days of SAR imagery of sea ice from the same area will be compared and movements of reference features will be measured, thus providing the average daily velocity as a function of distance along lines 10 to 500 km in length. LANDSAT imagery will be used for ground truthing purposes, and will also be compared with SAR imagery to attempt to make a distinction between open water and thin ice.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0057, NORTH PACIFIC EXPERIMENT (NORPAX) - TRANSEQUATORIAL AIR XBT SECTIONS DURING THE SHUTTLE EXPERIMENT

E.D. Stroup, University of Washington, Graduate School, *Seattle, Washington* 98105 (OCE7823792)

This project is part of the North Pacific Experiment (NORPAX). The long-range goal of NORPAX is to understand fluctuations in the upper layers of the Pacific Ocean with time scales of months to years and space scales in excess of 1,000 kilometers, and the relationship of these oceanographic fluctuations to the overlying and adjoining atmosphere. Achievement of this goal should eventually lead to improved weather/climate prediction for both the Pacific Ocean and North America.

One major component of NORPAX is a coordinated field to monitor the space and time variability of the density and velocity fields in the upper layers of the Equatorial Pacific Current system. This field program will occur between January 1979 and June 1980 and will involve a number of scientists. Measurements will be made from ships, airplanes and moored instruments. This grant will provide Dr. Stroup with the funds to organize and direct the 16 aircraft flights that will sample the equatorial temperature field by AXBTs. Dr. Stroup will insure the quality of the data, make analyses of the temperature fields and investigate relationships between the temperature fields and other oceanographic variables.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Ocean Sciences

5.0058, SEASAT PROGRAM - THE USE OF SEASAT IMAGERY TO STUDY THE BERING SEA ICE

S. Martin, University of Washington, School of Arts & Sciences, Dept. of Oceanography, *Seattle, Washington* 98105 (7-976; MO-A01-78-4335)

OBJECTIVE: Use existing sea-ice program (OCSEAP) to provide ground truth for evaluation of SEASAT capability (SAR, SMMR, VIR, ALT) for characterization of ice cover in the Bering Sea. Use SEASAT data for study of ice dynamics and wave absorption by sea ice.

APPROACH: Three different observational scales will be employed: SEASAT images; aircraft overflights and surface truth; and laboratory modeling.

The high resolution SAR images will be used to study the response of ice during periods of cyclonic and anticyclonic circulation. The SMMR and the VIR will provide complimentary large-scale images of the ice in order to determine the distribution of ice types, the large-scale response and the ice behavior preceding and following the SAR turn-ons. Altimeter data will also be looked at to see if it yields meaningful information about either long waves propagating into the pack, or pressure ridge statistics.

Surface truth data of the ice edge will be obtained during a research cruise of the NOAA ship SURVEYOR along the ice edge in Bristol Bay during 1978. Also a helicopter will traverse the sea ice in Norton Sound, and plan several low-level photographic overflights about regions of large-scale grease ice formation. Two periods of surface truth observations are also planned during the fall of 1978 and the winter of 1979.

Plans are to continue present laboratory work on the properties of ice grown in a wave field. This will yield physical insight into the large scale processes observed by satellite.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Environmental Satellite Service

5.0059, RURAL OXIDANT STUDIES AND THE ROLE OF NOX IN RURAL OXIDANT FORMATION

H.H. Westberg, Washington State University, School of Engineering, Dept. of Chemical Engineering, *Pullman, Washington* 99163 (R806683-01; G603A-AD-037)

OBJECTIVE: Aircraft and ground level measurements of ozone and its precursors will be made in the northeast United States with the intent of regional scale model validation. Because of the magnitude of the study, other government funded research groups will also participate in the meteorological and pollutant data collection program. Estimates of natural hydrocarbon emissions in this area of the United States will be made.

APPROACH: WSU will use an aircraft equipped with O3, NOx, and SO2 instrumentation to measure pollutant levels over large geographic areas of the northeastern United States. Grab samples for detailed hydrocarbons will be collected at strategic points along the flight path. These grab samples will be analyzed by sophisticated gas chromatographic techniques at a ground base site. The ground base site will also be fully

equipped to make several pollutant and meteorological measurements.

PROGRESS: WSU has performed several similar studies in past years. EPA reports of these activities are available. This study will not involve the use of any new measurement procedures but will collect more useful data for mathematic model validation.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab.

5.0060, ECOLOGY OF MANGROVES IN THE EAST COAST OF PENINSULAR MALAYSIA
W.K. Gong, Universiti Sains Malaysia, School of Biological Sciences, *Minden, Penang, Malaysia* (ECRS - PROJECT 6)

OBJECTIVE: To survey the extent of mangroves on the east coast of peninsular Malaysia as well as the floral composition.

APPROACH: Aerial survey; on-spot investigation by line transects; soil analysis; and economic importance.

ECOLOGICAL PARAMETERS FOR AQUATIC STUDIES: Latitude, 2 degrees, 30 minutes, 6 degrees, 30 minutes. Water salinity, 30-34 parts per thousand. Water temperature, 27-31 degrees C. Water pH, 8.4-8.8.

SUPPORTED BY Esso Production Malaysia Inc.

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, ANALYTICAL MODELLING OF LOAD-DEFLECTION BEHAVIOR OF INTERVERTEBRAL DISC SUBJECTED TO AXIAL COMPRESSION
M.L. Burns, Tuskegee Inst., Graduate School, *Tuskegee Institute, Alabama* 36088 (DF051970; AFOSR-78-3578)

AF function - the Air Force operational environment involves exposure to a wide variety of mechanical forces including flail and impact. The body in general and the musculoskeletal system particularly is adversely affected by these forces. This is of special importance in cases of ejection from high performance aircraft where the probability of disabling injury is unacceptably high. The lumbar region is subjected to most of the body load. One of the more common injuries is lumbar disc compression failure. A qualitative model for the mechanical behavior of the disc is needed. The overall objective of this research is to improve the knowledge of the physiology and mechanical properties of the human intervertebral disc. This work should provide essential information to understand the short duration, transient loading problems of the spinal disc and will also be applicable to the fields of diagnostic, preventive and reparative medicine. Deficiency - a mathematical model is needed for predicting the mechanical properties of individual discs and their associated vertebrae. Objective - seek an understanding of the mechanical properties and behavior of the spinal column. This interest ranges from problems associated with the man-machine environment subjected to external dynamic forces to those encountered in the selection of suitable materials for intervertebral disc replacement. Of particular interest is the biomechanical modelling of intervertebral joint response to axial compressions, where an intervertebral is understood to be an intervertebral disc and adjoining vertebrae. Contribution - directly supports research being conducted under sub-area 1.8

The initial task of this research will be to develop a computer program which can interpolate and adequately smooth the available creep response data of Kazarian. A mathematical analysis of experimental data will then be attempted, wherein, it may prove necessary to develop the analytical solutions of the 'Dominant Three-Kelvin-Unit Model'. It should then be possible to determine and tabulate Young's moduli and viscosity coefficients for the obtained analytical/mechanical models.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

6.0002, MEDICAL RESEARCH OF OPERATIONAL PROBLEMS IN ARMY AVIATION
F.S. Perryjohn, U.S. Dept. of Defense, Army, Medical Research & Development Command, Aviation Medicine Research Div., *Fort Rucker, Ozark, Alabama* 36360 (DA0B6894)

To provide the US Army information and recommendations for protection of aviator health from medical hazards encountered in operational Army aviation.

To apply accepted medical research methods in Army aviation to fulfill the above objective.

SUPPORTED BY U.S. Dept. of Defense, Medical Research & Development Command, Aeromedical Research Lab.

6.0003, DEVELOPMENT OF MEASUREMENT TECHNIQUES FOR THE MEDICAL ASSESSMENT OF VISUALLY COUPLED SYSTEM (VCS) COMPONENTS
R.W. Wiley, U.S. Dept. of Defense, Army, Medical Research & Development Command, Bio-Optics Div., *Fort Rucker, Ozark, Alabama* 36362 (DA0E6734)

To develop measurement techniques for the medical assessment of Visually Coupled System (VCS) components.

It is possible to inadvertently compromise an aviator's safety and physiological performance when designing and fabricating a VCS. Therefore, the VCS hardware must be scrutinized carefully to insure mutual man-machine conformity. The first phase of the study will be concerned primarily with the helmet mounted sight (HMS) component of the VCS. The approach during this phase will be to conduct laboratory and flight tests to determine the aiming/tracking capabilities of a crew member using head orientation. The effects of eye dominance, helmet suspension, helmet weighting and target speed on accuracy will also be investigated. The second phase will be focused on the assessment of helmet mounted displays (HMD). Factors such as display color, image quality and size, brightness, contrast and their impact on the visual system of the crew member and consequent performance will be investigated.

SUPPORTED BY U.S. Dept. of Defense, Medical Research & Development Command, Aeromedical Research Lab.

6.0004, INSTRUCTIONAL METHODS AND MEDIA
J. Reed, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Williams Air Force Base, Chandler, Arizona* 85224 (DF223820)

To determine the contribution of a variety of instructional methods and media on tactical flying training.

Phase I - Using a randomized control-experimental group, training on the air refueling director lights trainer will be evaluated. Phase II Using a one-group pre-test experimental design, correlation techniques will be applied to determine the relationship of turkey shoot results, normal syllabus grades and time to first kill on a standard target in the SAAC. Phase III - Using a one-group pre-test/post-test experimental design for an aerial gunnery task, correlation techniques will be applied to determine the relationship to overall air combat outcomes based upon pilot experience, turkey shoot results, peer ratings, and instructor pilot evaluation. Progress in the TAC ACES II Program will also be measured. Phase IV - An experimental and control group design will be employed utilizing the tactical voice communications trainer. Criterion performance will be evaluated to determine the training value of the device.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0005, KINETICS OF ENERGY METABOLITES IN HUMANS, DIABETES AND DRUG ACTION
G.L. Searle, U.S. Veterans Admin., Dept. of Medicine & Surgery, Medical Center, *4150 Clement St., San Francisco, California* 94121 (556-14-3966; 662-001-P)

The kinetics of energy metabolites (primarily glucose, its products and its precursors) are being evaluated in human and animal models.

Studies of the action of phenethylbiguanide (DBI) and dichloracetate (DCA) in conscious overnight fasted dogs indicate

that these two drugs in combination have significant hypoglycemic potential. In normal control animals the drugs increased glucose utilization by 150% and reduced glucose synthesis from lactate by one half. Glycemic level was, however, little affected. In the alloxan diabetic dog excessive glucose turnover was reduced by 34%, glucose synthesis from lactate was reduced by 56% and the blood glycemic level was reduced 17%.

In collaborative studies with NASA Ames Research a rat model proposed to reflect the altered metabolism of the muscular dystrophic state has been evaluated with respect to alanine turnover and glucose synthesis. Animals treated with CCl4 turned over ~.56 mg alanine per minute vs. a value of 0.33 mg per minute for controls. The percentage of glucose synthesized from alanine was increased by a factor of approximately 2 in the CCl4 treated animal. CONCLUSIONS: These results suggest that it will be quite possible to quantitate, through the assessement of alanine turnover and gluconeogenesis therefrom, the degree of muscle protein wasting that is known to occur in space flight.

SUPPORTED BY U.S. Veterans Admin., Dept. of Medicine & Surgery

6.0006, AUTOMATED AIDS TO ISD

F. Brecke, Veda Inc., *7851 Mission Ctr. Ct., San Diego, California* 92108 (DN994006; N61339-78-C-0142)

To determine the feasibility of reducing the resources and time required to develop ISD-based training through consolidation of common elements and links across Navy aircrew tasks to form a data base for each step in the ISD analysis process.

Instructional psychologists will examine ISD data produced in previous efforts and demonstrate the feasibility of a general data base.

SUPPORTED BY U.S. Dept. of Defense, Naval Training Equipment Center, Human Factors Lab.

6.0007, LOW-COST APPROACH AND LANDING TRAINER REQUIREMENTS

K.W. Lindenberg, Appli Mation Inc., *1000 Woodcock Rd., Orlando, Florida* 32803 (DN894028; N61339-78-C-0134)

Low-cost, part-task trainers could radically improve training effectiveness. This effort will refine and perform an initial evaluation of a system developed for field evaluation.

An approach and landing refresher trainer will have known problems corrected and then enter iterative development at a field site to arrive at a system for initial evaluation. Trainer has been developed in the laboratory using low-cost, off-the-shelf components.

SUPPORTED BY U.S. Dept. of Defense, Naval Training Equipment Center, Human Factors Lab.

6.0008, AUTOMATED ADAPTIVE TRAINING FOR THE LANDING SIGNAL OFFICER

R. Breaux, U.S. Dept. of Defense, Navy, Naval Training Equipment Center, Human Factors Lab., *Orlando, Florida* 32813 (DN794013)

To develop, implement and test, in the context of an automated trainer, techniques for training which will improve the training progress of the landing signal officer (LSO) and thereby reduce cost in manpower and equipment, through development of models of the LSO task and pilot-LSO interaction. Use of modeling techniques can increase training effectiveness by providing objective performance measurement and guidance in skill acquisition at any point in the training process.

The effort consists of: (1) identification of visual and auditory cues; (2) development of models of the visual scene, pilot response, and pilot-LSO interaction; (3) application of voice recognition, performance measurement, and automated adaptive training technologies; and (4) empirical test of effectiveness of the training system.

SUPPORTED BY U.S. Dept. of Defense, Naval Training Equipment Center, Human Factors Lab.

6.0009, DETERMINATION AND IDENTIFICATION OF HUMAN BRAIN WAVE PATTERNS ASSOCIATED WITH COGNITIVE AND PERFORMANCE EVENTS (ABBREV)

E. Donchin, University of Illinois, Urbana Champaign Campus, School of Liberal Arts & Sciences, Dept. of Psychology, *Urbana, Illinois* 61801 (DN675068; N00014-76-C-0002)

The overall objective is to attempt to determine and identify human brain wave patterns associated with (1) particular stimuli; (2) cognitive events in a learning situation; and (3) performance events in a simulated aircraft cockpit. Such information could provide a basis for improving human performance in decision making and man-machine communication.

Experiments will continue on: (1) further elucidation of the event related potential (ERP) vocabulary, e.g., stability of P300/expectancy relationships and ERP differences between target and non-target stimuli; (2) biocybernetic tests in the cockpit environment, e.g., effects of turbulence-imposed work load on processing during simulated landing; and (3) development of a closed loop biocybernetic channel, i.e., one in which some parameter of the ERP is used by the controlling computer to modify system operating parameters, e.g., measures of work load and task sharing.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

6.0010, ANTHROPOMETRIC STUDY OF NAVAL AIRCREW PERSONNEL

H.G. Gregoire, U.S. Dept. of Defense, Navy, Naval Air Test Center, *Patuxent River, Maryland* 20670 (DN977636)

To develop a new, more useable anthropometric data base for use in the development and evaluation of aircrew stations, life support and survival equipment, emergency egress envelopes, and job classification of aircrew personnel.

A new anthropometric survey of aircrew personnel will be conducted. The effort will be accomplished in four phases. Phase I will be the identification/development of an appropriate measuring methodology. During Phase II the anthropometric parameters to be included will be identified and an optimal sampling strategy selected. The data collection will be accomplished in Phase III. The final phase will be the development of a report format which will optimize the usability of the data.

SUPPORTED BY U.S. Dept. of Defense, Naval Medical Research & Development Command, National Naval Medical Center

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, ARTIFICIAL INTELLIGENCE AND HUMAN ERROR PREVENTION - A COMPUTER-AIDED DECISION MAKING APPROACH

R.W. Brady, University of Illinois, Urbana Champaign Campus, Graduate School, *Urbana, Illinois* 61801 (OS-80020; OS161407 (TRAIS NO.))

The objective of this research is to demonstrate the feasibility of integrating an intelligent computer system into the cockpit of a civilian aircraft. The computer will be viewed as an adaptive crew member who could assist the pilot and during critical periods when demands upon the pilot may exceed his capability to respond quickly and coherently, and reduce his workload to decrease the likelihood of an aircraft accident. Specific goals for the system are that it performs non-critical tasks. The system shall inherently be able to plan and order tasks according to degree of criticality and shall be able to perform these tasks if requested by the pilot to do so.

SUPPORTED BY U.S. Dept. of Transportation, Office of the Secretary of Transportation

7.0002, CATEGORICAL MACHINE THEORY, WITH APPLICATIONS TO SYNTAX-DIRECTED TRANSLATION AND CONTROL THEORY

M.A. Arbib, University of Massachusetts, Amherst Campus, School of Arts & Sciences, Dept. of Computer & Information Science, *Amherst, Massachusetts* 01002 (MCS76-84477)

This research is defined by two types of questions: the first type addresses specific problems within the theories of computation and control; the second explores the applicability of various algebraic techniques. Questions within control theory include a unified theory of machine interconnection, the duality of estimation and control, the proper generalization of the internal model principle, and the extension of the theory of linear continuous-time systems to handle time-varying systems and delay-differential equations. Topics within computation theory include iterative theories, more applicable models of nondeterminism, graph automata, and the algebraic semantics of SIMULA-like languages. Algebraic techniques whose applications will be explored are algebraic theories and topoi (a topos is a general structure which can specialize to boolean or intuitionistic logic on the one hand, and to a category of sheaves as used in algebraic geometry on the other). These tools and those forged in earlier research on categorical machine theory will hopefully make it possible to solve problems in computation and control which would be impossible, or at least highly intractable, without them.

This is a continuation of grant MCS-7203733AO2.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Mathematical & Computer Sciences

7.0003, INTERPRETATION OF SATELLITE IMAGERY BY COMPUTER-QUANTITATIVE METHODS

P.R. Baumann, State University of New York, Albany Campus, Graduate School, *1400 Washington Ave., Albany, New York* 12203 (SER78-00001)

The objective of this proposed project is to develop a computer software system and related instructional materials that will provide undergraduate students the opportunity to learn how to interpret satellite imagery by using computer and quantitative techniques. Fourteen times a day both of NASA's LANDSAT satellites orbit the earth collecting land use and resource information from the earth's surface. Together, these satellites are able to scan any area of the globe, except the poles, every nine days. As living space in the United States and the world continues to shrink rapidly, land use and resource planning become more and more vital. Americans are being faced now and will continue to be faced for many years to come with the problem of how to use best their finite space and resources. To make informed decisions, up-to-date land use and resource information become vital. To employ this new technology for the purpose of acquiring information needed to make meaningful decisions about the use of our land and resources, it is necessary to make people aware of its capabilities and potential and to train people to use it, which represents the overall goal of this proposed project.

A course is to be developed which will provide students with experience in interpreting satellite imagery in the digital form by using computer and quantitative techniques. This approach has both economic and accuracy advantages over the almost universal photographic interpretation.

SUPPORTED BY U.S. National Science Foundation, Directorate for Science Education, Div. of Science Education Resources Improvement

7.0004, IMAGE PROCESSING BY MEANS OF HIERARCHICAL RELAXATION SHAPE ANALYSIS

L.S. Davis, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Computer Sciences, *200 W. 21st St., Austin, Texas* 78712 (ENG79-04037)

Shape analysis is crucial to the solution of many problems in image pattern recognition. One of the most successful approaches to automatic shape analysis has been the syntactic approach. In this research program, a new syntactic analysis technique called hierarchical relaxation, based on representing shapes by stratified shape grammars from which contextual constraints on the organization of shapes can be automatically computed, is explored. Hierarchical relaxation was designed specifically to account for the ambiguity associated with extracting primitives from shapes, a problem not explicity dealt with in most syntactic pattern analysis schemes. Hierarchical relaxation is being investigated in the context of a real image pattern analysis problem - recognizing airplanes based on their silhouettes.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

7.0005, OPTIMAL SURFACE DESCRIPTIONS FROM LIMITED DATA

H. Fuchs, University of Texas, Dallas Campus, Graduate School, *Richardson, Texas* 75080 (MCS77-03905)

In many technical endeavors the surface of a three-dimensional solid must be reconstructed from limited data, either to enable comprehension of its overall structural characteristics, or to allow its automatic manipulation and analysis.

Past research has generated encouraging preliminary results for the class of situations in which the data are specified as a sequence of single contours, and a new algorithm which generates, from any sequence of contours, an optimum surface, according to a minimum-surface-area measure.

This research is attempting to generalize this approach to the large class of structures which contain a variable number of closed contours on each level. Methods of compressing the resulting surface description with minimum degradation to the structural definition are being explored. Such surface descriptions are increasingly used in computer-aided design, bio-medical research, numerical control, visual flight simulation, and topography.

SUPPORTED BY U.S. National Science Foundation, Div. of Mathematical & Computer Sciences

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, PURCHASE AND INSTALLATION OF A HIGH CURRENT, HIGH STABILITY ACCELERATOR

C.A. Barnes, California Inst. of Technology, Graduate School, Dept. of Physics Mathematics & Astronomy, *1201 E. California Blvd., Pasadena, California* 91109 (PHY77-10134)

This grant will provide funds for the purchase and installation of a high current Van de Graaff accelerator. The voltage will be very stable, to plus or minus 1 KeV at full voltage current. The second year of this grant will provide funds for auxiliary equipment to implement a highly original research program in a wide variety of subjects in nuclear science with a strong emphasis on nuclear astrophysics.

This is the first year of a two-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0002, THE ENERGY DEPENDENCE OF PARTIAL PHOTOIONIZATION CROSS-SECTIONS IN THE SOFT X-RAY REGION

I.E. Lindau, Stanford University, Stanford Electronics Lab., Dept. of Electrical Engineering, *Stanford, California* 94305 (DMR79-13102)

The energy dependence of partial photoionization cross-sections in the far ultraviolet and soft x-ray regions, 20 to 2000 eV (600 to 6 A) will be determined in order to utilize the unique properties of synchrotron radiation as an excitation source. The adequacy of the Hartree-Fock description of the photoionization process will be tested for the 1s electrons of a few systems with great importance in chemisorption studies. The strengths of plasma as functions of excitation energy will be studied with particular emphasis on testing the validity of the sudden approximation close to threshold and the relative contributions to

the plasma strength of intrinsic and extrinsic losses. Resonance photoemission effects will be examined systematically for transition metals and rare earths, where excitation occurs into discrete states in a partially filled shell. The strong multielectron effects observed in the 4d, 5s, and 5p subshells of, for instance, cesium and barium will be compared in detail to the theoretical predictions of the random phase approximation with exchange (RPAE). The physical mechanism behind shake-up and shake-down processes will be studied for compounds with open d-shell configuration and later be extended to chemisorption of small molecules on 3d, 4d, and 5d transition metals.

Research previously supported by DMR77-02519-A01.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0003, U.S.-U.S.S.R. COLLABORATION IN PLASMA PHYSICS

B.D. Fried, University of California, Los Angeles Campus, School of Letters & Science, Dept. of Physics, *405 Hilgard Ave., Los Angeles, California* 90024 (PHY7611129)

This grant will cover the domestic U.S. cost of a visit by the noted Soviet theoretical physicist V.E. Zakharov. Dr. Zakharov will join the ongoing plasma physics research at UCLA, and initiate studies of wave-particle energy transfer in turbulent plasma. This activity is part of the US-USSR Collaboration Program.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0004, RESEARCH IN ATOMIC AND MOLECULAR PHYSICS AT THE JOINT INSTITUTE FOR LABORATORY ASTROPHYSICS

A. Phelps, University of Colorado, Boulder Campus, Joint Inst. for Lab. Astrophysics, *1200 University Ave., Boulder, Colorado* 80302 (PHY79-04928)

Support of experimental and theoretical research in atomic and molecular physics will be continued at the Joint Institute for Laboratory Astrophysics. The JILA research program is grouped into four broad areas: 1) The interaction of electromagnetic radiation with atomic and molecular systems, particularly the interaction of intense laser radiation with atoms and molecules either in an isolated environment or when subject to perturbing collisions. 2) The study of negative ion physics and of photodetachment processes. 3) Collision processes involving state selected neutral or ionic atomic and molecular species. 4) Fundamental and precision measurements, particularly using the latest advances in atomic metrology.

In addition, one or two conferences and/or workshops will be held each year, to focus on topics of intense current interest and bring together specialists to discuss progress and prospects for various sub-fields.

This work is a continuation of that previously supported by Foundation grant PHY76-04761A02.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0005, CURRENT INHOMOGENEITIES IN CONDUCTORS

W.F. Love, University of Colorado, Boulder Campus, School of Arts & Sciences, Dept. of Physics & Astrophysics, *1200 University Ave., Boulder, Colorado* 80302 (DMR76-83362 A01)

A magnetooptic system for the detection of inhomogeneous current flow in conductors will be further developed and used to study single crystals of potassium grown under a variety of conditions, which exhibit a domain structure dependent on the method of fabrication. The magnetooptic technique, utilizing paramagnetic europium glasses exhibiting high Faraday rotation, can determine whether the domain structure is related to the anomalous behavior of potassium at low temperatures.

This research was previously supported under DMR 7683362.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0006, QUATERNARY SEMICONDUCTOR MATERIALS

E.M. Swiggard, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN980021)

To prepare single crystal epitaxial films of the III-V compounds, to develop epitaxial growth technology, to lattice match layers to substrates and to develop those III-V epitaxial materials for Navy solid-state electronic and electrooptic devices.

Single crystals in epitaxial form such as Ga, In, As, and P have applications in electrooptic and electronic devices. These compounds will be prepared by various applicable expitaxial techniques including liquid phase and vapor phase. New methods of film growth are to be sought to improve material properties and processing technology. Structural match to InP substrates will be made so that the epitaxial films will be strain-free with low defect interfaces. Novel growth and purity control steps will be investigated to control impurity levels and substrate EPI interface. New material combinations will be investigated for both electrooptic materials and wide band gap semiconductors.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

8.0007, RESONANCE SPECTRA OF SYNTHETIC METALLOPORPHYRINS

D.C. O'Shea, Georgia Inst. of Technology, School of Physics, Dept. of Physics, *225 North Ave. N.W., Atlanta, Georgia* 30332 (DMR79-07758)

Resonance Raman spectroscopy promises to be a powerful technique for elucidating the vibrational and electronic structures of both the ground and excited states of synthetic metalloporphyrins. Previous work from Professor O'Shea's laboratory has shown that the variation in Roman spectrum with exciting laser wavelength ('excitation profile'), in weak coupling cases, can be explained in terms of coupling constants for the molecule. The goals of the present work are (1) to extend the range of Raman excitation wavelengths into the near ultraviolet in order to probe extremely strong resonance states of the metalloporphyrins and, (2) to develop the techniques of computerized resonance Raman difference spectroscopy in order to discern changes in the Raman spectra due to changes in the substituents on, or chemical environment of, the macrocycles.

Because of the close structural resemblance of the model porphyrins to chlorophyll, heme proteins, and other biological chromophores, these techniques, once developed, are expected to enable one to examine these important biological molecules and the effects of the environment on their activity. It has been shown, for instance, that small changes in cytochrome c structure can be discerned by resonance Raman difference techniques.

First year of a three-year continuing grant; renewal of work supported by DMR77-05971.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0008, CLASSICAL AND QUANTUM THEORY OF TURBULENT BEHAVIOR IN NONLINEAR SYSTEMS

J.B. Ford, Georgia Inst. of Technology, School of Sciences & Liberal Studies, Dept. of Physics, *Atlanta, Georgia* 30332 (DMR78-27584)

Research previously supported by DMR7611966. Theoretical research on turbulent behavior in nonlinear systems will be carried out. In particular a new theoretical description for turbulent trajectories in classical nonlinear Hamiltonian systems will be developed. The phenomenon of energy transport as heat in many-body, model nonlinear systems will be examined with

the possibility of demonstrating that it is a consequence of their underlying turbulent orbits, and to develop an analytic theory predicting the thermal conductivity of these models. Also, a quantum theoretical description of turbulent behavior will be developed for those systems in which turbulent behavior is known to occur classically. The common goal of these investigations will be to extend our knowledge regarding the stochastic properties of completely deterministic nonlinear systems which are of interest to many areas of condensed matter. This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0009, RESEARCH PROGRAM IN MATERIALS SCIENCES

M.H. Cohen, University of Chicago, School of Physical Sciences, Dept. of Physics, *5734 S. Ellis Ave., c/o Hinds Geophysics Lab., Chicago, Illinois* 60637 (DMR78-24698)

Major collaborative programs are continued on disordered materials and on phase transitions. The former emphasizes disordered graphite intercalates, amorphous semiconductors, and glassy metals. The latter, representing a modification of the previous emphasis, stresses the role of metastability in transitions, especially in disordered and in two-dimensional materials.

Two newly initiated programs represent the addition of new capabilities to the prior program. These are: surface reactions, involving theoretical and experimental studies of reactions on solid surfaces; and the development of materials science applications of high resolution electron microscopy.

Partial support is also provided for the operation of central experimental facilities. This award is a continuation of DMR77-24223.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0010, STATISTICAL PROPERTIES OF PLASMA TURBULENCE

M. Raether, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Coordinated Science Laboratory/Physics, *207 Engineering Hall, Urbana, Illinois* 61801

The objective of this research project is to obtain information about turbulent plasma states that goes beyond the traditional description of these states in terms of correlation functions and/or power spectra. A system has been constructed that allows the measurement of one and two point probability densities of electron density fluctuations in a field of ion acoustic turbulence in a low pressure discharge in helium.

SUPPORTED BY University of Illinois

8.0011, WAVE-WAVE INTERACTIONS

M. Raether, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Coordinated Science Laboratory/Physics, *207 Engineering Hall, Urbana, Illinois* 61801

Studies of wave-wave interactions in an electron beam-plasma system led to the discovery of a spontaneous decay instability of a beam-plasma wave into an ion acoustic wave and an electron plasma wave. Good agreement was found with a theoretical model based on three-wave coupling.

SUPPORTED BY University of Illinois

8.0012, SPECTROSCOPIC INVESTIGATION OF PLASMA TURBULENCE

M. Raether, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Physics, *207 Engineering Hall, Urbana, Illinois* 61801

In continuation of the consulting agreement between the University of Illinois and the University of Azarabadegan that was started in 1977, a cooperative research program in plasma physics was initiated during Dr. Raether's six-week stay at Tabriz in summer 1978. The principal investigators at Tabriz are Prof. Shirinpour and Prof. Moslehi-Fard. The program will be devoted to a spectroscopic investigation of plasma turbulence with the main objective to measure ion temperatures during ion acoustic turbulence.

SUPPORTED BY University of Illinois

8.0013, FABRICATION AND PROPERTIES OF ONE-DIMENSIONAL SYSTEMS

N.J. Giordano, Purdue University, School of Science, Dept. of Physics, *Executive Bldg., West Lafayette, Indiana* 47907 (DMR79-06716)

An experimental program to study the properties of several different types of one-dimensional systems will be carried out. This work falls into two main categories. (1) The electrical properties of random one-dimensional systems will be studied to provide a detailed, quantitative test of recent theoretical predictions that Anderson localization should be observable in these systems. (2) A new type of superconducting point contact, the first in which the geometry of the contact region is under direct experimental control and its nature well characterized, will be investigated. This will allow a more detailed study of the physics of these devices than has been possible with point contacts of conventional design. Moreover, these point contacts should have good mechanical and thermal stability making them prime candidates for a number of practical applications.

In order to make the samples required for these experiments, several new techniques for fabricating ultra small structures will be developed. These techniques will not be limited to applications described above, but should also prove useful in many other microfabrication problems.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0014, COLLECTIVE STRUCTURE OF MASS-100 NUCLEI

P.C. Simms, Purdue University, School of Science, Dept. of Physics, *Executive Bldg., West Lafayette, Indiana* 47907 (PHY79-19187)

The interactions between nuclei are so complicated that it is necessary to treat most particles in a nucleus as an assembly with simple properties. Many aspects of nuclear structure can be described in terms of the collective properties of the assembly with a few nuclei treated as moving in the average potential created by the assembly. Nuclei with relatively large deformations have been found in the rare-earth and actinide regions, and a rotational description has been very successful for the properties of these nuclei. There has been no satisfactory description for the 'transitional' nuclei between closed shells and regions of strong deformation. This research program combines precise systematic measurements and detailed theoretical calculations to show that many transitional nuclei can be described as slightly deformed rotors. Excited nuclear states are produced by heavy-ion-(xn) reaction and studied with in-beam gamma ray spectroscopy; excitation functions, angular distributions, coincidence, directional correlation, linear polarization, and Doppler shift measurements are made on gamma rays. Energy levels and decay properties are determined and interpreted with a Coriolis-coupling calculation similar to that used for strongly deformend nuclei. This is the first increment of a three-year continuing grant, currently supported under NSF grant PHY-12610A01.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0015, APPLICATIONS OF QUANTUM ELECTRODYNAMICS TO PROCESSES OF CURRENT INTEREST IN ATOMIC AND NUCLEAR PHYSICS

W.R. Johnson, University of Notre Dame, College of Science, Dept. of Physics, *Notre Dame, Indiana* 46556 (PHY79-09229)

Research in theoretical atomic physics initiated under NSF grant PHY77-15141 will be continued. Among the topics to be investigated are: a) Relativistic random phase approximation (RRPA) calculations of susceptibilities and shielding factors for closed-shell atoms and ions throughout the periodic system. b) Development of a relativistic version of the multichannel quan-

tum defect theory (MQDT) and application of the MQDT in conjunction with the RRPA to study highly excited spectra and autoionizing resonances in closed-shell atoms and ions. c) Application of the RRPA to study core polarization corrections to the theory of optical rotations in Tl, Pb, and Bi.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0016, SOLID-STATE STUDIES OF AMORPHOUS MAGNETIC SOLIDS

C. Chien, Johns Hopkins University, School of Arts & Sciences, Dept. of Physics, *34th & Charles Sts., Baltimore, Maryland* 21218 (DMR89-10536)

Mossbauer spectroscopy, magnetization, susceptibility, resistivity and X-ray diffraction measurements will be utilized to study the hyperfine interactions, structural properties, magnetic properties, transport properties, critical phenomena, percolation, spin glass behavior and collective excitations (spin waves) in amorphous magnetic solids. Some studies will be made in close collaboration with groups using other techniques, such as neutron diffraction. Solids which can be made in both crystalline and amorphous forms, amorphous solids with abundant antiferromagnetic exchange interactions, non-eutectic binary amorphous systems and nominally pure amorphous metals will be studied in order to gain further insight in these largely unexplored areas. The results of these studies provide needed information for the understanding of the intrinsic properties of amorphous magnetic solids, many of which also show potential for practical applications.

This research was previously supported by DMR 7709598. This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0017, ATOMIC AND MOLECULAR PHYSICS

D. Kleppner, Massachusetts Inst. of Technology, School of Science, Dept. of Physics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (PHY79-09743)

Research will continue in several broad areas: atoms in strong electronic and magnetic fields, weakly bound molecules, atomic line broadening, and cold hydrogen atoms. Studies of atoms in high fields will be extended to the region where the magnetic interaction is stronger than the Coulomb interaction, and investigation of the weakly bound molecule NaAr. To develop techniques for high resolution studies of free-bound transitions, and to initiate studies of Rydberg molecules; a systematic study of line broadening in which the intensity and polarization of reradiation due to both elastic and inelastic collisions will be investigated, together with two newly predicted types of light-induced collisional energy transfer; applications of newly developed cold atomic hydrogen sources to precision measurements in excited atomic hydrogen.

This is the first year of a 4-year continuing grant.

This research is a continuation of that previously funded under NSF grant PHY77-09155A01.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0018, PHYSICS OF INTERSTELLAR MOLECULES

A. Dalgarno, Smithsonian Institution, Astrophysical Observatory, *60 Garden St., Cambridge, Massachusetts* 02138 (144410-31A)

Computations necessary for the calculation of the rate coefficient for proton exchange reactions.

SUPPORTED BY Smithsonian Institution, Astrophysical Observatory

8.0019, DEFECTS IN SEMICONDUCTORS

C. Penchina, University of Massachusetts, Amherst Campus, School of Arts & Sciences, Dept. of Physics & Astronomy, *Amherst, Massachusetts* 01002 (DN675518; N00014-76-C-0890)

Development of electronic and optical components for naval communications and surveillance systems will require increased understanding of the properties of semiconductors. Understanding of the role of impurities and defects is imperative to the preparation of such materials and to prediction of their behavior in devices and in a radiation environment.

The investigator is using a variety of techniques to investigate the electronic nature of the deep level states in gallium arsenide produced by oxygen and chromium impurities. These techniques include photoionization cross-sections, photo-Hall effect, photocapacitance, and cathodoluminescence measurements. The effects of stress on these measurements are used to deduce defect symmetry properties, and temperature effects are used to deduce relationship of defect state to the band structure of the solid. Photoluminescence spectra having phonon sideband induced structure will be used to determine the magnitude of Franck-Condon shifts. Theoretical studies of the temperature dependence of the energy levels and on photoionization cross-sections will continue. Also calculations will be made on electroabsorption processes and their relation to site symmetries.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0020, ELECTRON TRANSPORT AND MAGNETIC INTERACTIONS IN METALS

J. Bass, Michigan State University, School of Arts & Letters, Dept. of Physics, *Soil Science Bldg., East Lansing, Michigan* 48824 (DMR77-04680 A02)

Experimental studies of low-temperature transport properties previously supported by DMR7514138 will be continued. Magnetothermoelectric measurements on simple metals at low and ultra-low temperatures will be done in order to achieve a better understanding of many-body effects in thermoelectricity (i.e., electron-phonon mass enhancement and the Nielsen-Taylor effects) and of the source of the Giant Magnetothermopower Oscillations which were discovered in aluminum and indium in recent research done in this project. Also, the sources and properties of the recently discovered low- and ultra-low-temperature thermoelectric anomalies in tungsten will be investigated. Finally the studies of dilute magnetic alloys using the technique of combining traditional transport and magnetic measurements with direct and independent determinations of the microscopic spatial distribution of impurities will be continued.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0021, INTERACTION OF ELECTRONS AND IONS WITH PLASMA

M. Seidl, Stevens Inst. of Technology, Graduate School, Dept. of Physics & Engineering Physics, *Castle Point Station, Hoboken, New Jersey* 07030 (PHY79-08555)

A study of the production and heating of volume plasmas by electron beams will be continued. The broad objective of the research is to explore the basic processes responsible for electron beam heating of plasmas confined in magnetic mirrors. The importance of the various interaction modes for transverse electron heating will be assessed. For this purpose the nonlinear evolution of the slow and fast cyclotron modes will be studied. The role of plasma and magnetic field inhomogeneities for transverse heating will be explored. Production of thin layers of dense plasmas on the surface of nonmetallic solids will be initiated. Three basic production methods will be explored: ohmic heating, electron bombardment, and ion bombardment. Ion emission from these surface plasmas will be studied. Particular attention will be paid to thermionic emission of alkali ions from zeolites and to secondary emission of negative hydrogen ions from surface plasmas produced by bombarding alkali hydrides with alkali ions.

This research is a continuation of that previously supported under NSF grant PHY-7707214A02.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0022, HYDROGEN PUMPED IODINE LASER
J.A. Blauer, Bell Aerospace Co., *P.O. Box 1, Buffalo, New York* 14240 (DF187160; F29601-76-C-0063)

The objective of this work is to develop a high energy, chemically pumped, electronic transition laser. Detailed studies of the H and HI reaction will be used to investigate energy transfer from vibrationally excited hydrogen molecules to iodine atoms and to demonstrate lasing by electronically excited iodine atoms at 1.315 microns.

Atomic hydrogen will be generated by shock heating mixtures of H(2) and Ar to 4500 degrees K. The hydrogen atoms will be expanded out of the shock tube through a nozzle where HI will be injected into the flow. Optimum cavity conditions will be sought to demonstrate lasing. Other techniques to generate sufficient flows of hydrogen atoms will be pursued. Other energy transfer systems will be evaluated as to their potential for high energy, chemically pumped, electronic transition lasers.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Weapons Lab.

8.0023, LIMITED DIMENSIONALITY AND SURFACE EFFECTS IN METALLIC SYSTEMS
R.A. Buhrman, Cornell University, Ithaca Campus, Graduate School, Dept. of Applied Physics, *101 Sage Graduate Ctr., Ithaca, New York* 14850 (DMR77-09879 A02)

Experimental research on the electronic and magnetic properties of metals in limiting and unusual physical environments previously supported by DMR-7402609 will be continued. Static and dynamic transport techniques and resonance techniques will be used to investigate the quantum phenomena arising from size effects in microminiature metallic particles. The intent of this research is to advance the understanding of the transition regime between metallic and atomic-like behavior in such systems. The magnetic susceptibility of metals at or near free surfaces will be investigated by the use of high-resolution susceptibility measurements. A new surface-sensitive magnetic probe that is proposed for development will also be used. An exploratory investigation of the electrical and magnetic properties of ultra-finely dispersed cermet materials will be initiated.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0024, CRITICAL BEHAVIOR OF ROTATION-INVARIANT FERROMAGNETS
O.A. McBryan, Cornell University, Ithaca Campus, School of Arts & Sciences, Dept. of Mathematics, *Ithaca, New York* 14850 (DMR77-04105)

Research in theoretical statistical mechanics will be carried out. In particular, the critical behavior of two-dimensional ferromagnets which have rotationally-invariant spin interactions will be investigated. The critical properties of these systems are believed to be similar to those of gauge-invariant quantum field theories in four dimensions which are currently used to describe the strong interactions of elementary particles. The relationship between these two branches of theoretical physics will be investigated. Also, it will be determined rigorously whether or not SO(n)-symmetric two-dimensional ferromagnets exhibit phase transitions at low temperatures.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0025, JOINT US-USSR COLLABORATION IN SEMICONDUCTOR PHYSICS (ABBREV)
J.W. Corbett, State University of New York, Albany Campus, School of Arts & Sciences, Dept. of Physics, *1400 Washington Ave., Albany, New York* 12222 (INT76-10315)

This grant is to support the establishment of a two-year collaboration between the Institute for the Study of Defects in Solids and the Institute for Semiconductor Physics in Novosibirsk, USSR. This collaboration will take the form of exchanges of senior scientists, joint projects and coordinated research programs in the area of semiconductors. US scientists are to be exposed to the current Soviet state of research in this field at one of the most advanced research centers in the USSR.

SUPPORTED BY U.S. National Science Foundation, Div. of International Programs

8.0026, DEFECTS IN SEMICONDUCTORS
J.W. Corbett, State University of New York, Albany Campus, School of Arts & Sciences, Dept. of Physics, *1400 Washington Ave., Albany, New York* 12222 (DN123026; N00014-75-C-0919)

Studies of defects in semiconductors, defects produced by radiation or by ion implantation of foreign species, are of great importance to a broad spectrum of Navy electronics systems. Radiation effects studies support nuclear radiation vulnerability programs and ion implantation studies support new material and electron device technology.

The investigator combines a variety of theoretical and experimental techniques for identifying defects in semiconductors and understanding their effect on material properties. EPR, ENDOR, transient capacitance, Rutherford backscattering, channeling, and optical measurement techniques are used. Current efforts include studies of hydrogen-related defects in silicon, and studies of lithium, boron, and gold-related defects. Another problem area is the relationship of oxygen impurities and heat treatment on the defect nature of silicon. Recently, interest has risen on the problem of impurities related to dislocations and these will be studied. The renormalization group technique will be applied to the theory of defects. Studies will be made on nature of defects in laser annealed semiconductors.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0027, OPTICAL STUDIES OF SUPERCONDUCTING TUNGSTEN BRONZES
E.M. Brody, University of Rochester, School of Engineering & Applied Science, Dept. of Aerospace & Mech Science, *260 Crittenden Blvd., Rochester, New York* 14627 (DMR78-12993)

Raman and Brillouin inelastic light scattering and photoelastic modulation ellipsometry will be used to study the electron and phonon properties affecting superconductivity in the hexagonal tungsten bronze system AxWO3 (A equals K, Rb, Cs, Tl) as a function of composition and temperature. The Brillouin studies will probe for acoustic phonon softening and permit the determination of the single crystal elastic moduli. Ellipsometry will be used to determine the optical constants necessary to interpret the Brillouin spectra. This work is important for determining the properties of materials which govern their macroscopic superconducting behavior.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0028, ENERGY DEPENDENCE OF X-RAY POLARIZATION ROTATION
G.G. Cohen, Vassar College, Graduate School, Dept. of Physics & Astronomy, *Raymond Ave., Poughkeepsie, New York* 12601 (DMR7810308)

Recent laboratory experiments have shown that the plane of polarization of a linearly polarized X-ray beam can be rotated by simple transmission through a (110) Si crystal. Both the amount of rotation and the amount of absorption of X-ray depended on the orientation of the crystal in the incident beam, an X-ray analog to optical birefringence.

Two new experiments will be performed: (1) study the effect at higher energy (Mo K alpha at 0.709A), varying such crystal parameters as the thickness; and (2) test the earlier results with a (110) Ge crystal by performing a polarization rotation experiment in the critical region near an absorption edge.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0029, NUCLEAR PHYSICS RESEARCH AT LOW & INTERMEDIATE ENERGIES

S.L. Blatt, Ohio State University, Columbus Campus, School of Mathematics & Physical Sciences, Dept. of Physics, *164 W. 17th Ave., Columbus, Ohio* 43210 (PHY79-09157)

This is a continuation of research previously supported under grant PHY77-05021 A01. This grant will support a range of experiments in nuclear reactions, nuclear spectroscopy and related areas of nuclear science. The work will be carried out using a 7 MV Van de Graaff accelerator and at the University of Indiana Cyclotron. A special attribute of the Van de Graaff facility is the polarized ion source. Specific areas of research interest include polarization phenomena, properties of resonant nuclear states, radiative capture reactions, and intermediate energy reactions. Studies in atomic physics and nuclear astrophysics will be initiated.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0030, ELECTRICAL TRANSPORT IN FERROMAGNETIC METALS AND ALLOYS

L. Berger, Carnegie Mellon University, Mellon Inst. of Science, Dept. of Physics, *4400 5th Ave., Pittsburgh, Pennsylvania* 15213 (DMR78-24679)

Two experiments will be done to observe two newly predicted effects involving the interaction of ferromagnetic domains with electrical currents in pure cobalt. In the first experiment, a direct current crossing the domain walls is expected to cause the coercive field (Hc) of the ferromagnet to decrease and even to vanish. In the second experiment, the dragging of domain walls by a current is expected to be facilitated by the application of a variable magnetic field.

In addition, the magnetoresistance of concentrated Pd-Fe, Pd-Co, Pd-Ni-Fe, Pt-Fe, and Pt-Co alloys will be measured at temperatures down to 4 degrees K. These materials are among the most likely to have a large and technically useful magnetoresistance. Also, the Hall effect of these alloys will be measured. The effect of alloy ordering on magnetoresistance will be studied. This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0031, THEORETICAL INVESTIGATIONS IN HIGH-ENERGY AND ELEMENTARY PARTICLE PHYSICS

R.D. Carlitz, University of Pittsburgh, School of Arts & Sciences, Dept. of Physics, *4200 5th Ave., Pittsburgh, Pennsylvania* 15260 (PHY77-08287 A01)

Research will be done in theoretical physics to further our understanding of the elementary particles.

The investigations will be aimed at uncovering the basic laws that govern the interactions of the fundamental constituents of matter. At the present stage of our knowledge we have only a guess as to what these fundamental constituents are. We know that ordinary matter is composed of chemical elements and chemical elements are reducible to atoms and atoms are made up of atomic nuclei and electrons. The nuclei are themselves collections of protons and neutrons held together by the strong nuclear force. The electrons appear to be elementary (not composites of some other particles), but the protons and neutrons show themselves to be complex structures in a variety of experiments. This has led to the hypothesis that they are composed of more fundamental constituents. These hypothetical constituents of the proton and neutron are called quarks. They are hypothetical because, despite occasional claims to the contrary, no one has yet succeeded in convincing the community of physicists that he has detected a quark in an experimental apparatus.

The mathematical formulation of the laws of nature which govern the interactions and combinations of these quarks is very complicated, and we do not at this time know what final form it will take. Most of the work to be done in this project is involved with one or another aspect of this problem.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0032, LIGHT SCATTERING IN FLUIDS

W.I. Goldburg, University of Pittsburgh, School of Arts & Sciences, Dept. of Physics, *4200 5th Ave., Pittsburgh, Pennsylvania* 15260 (DMR77-09910 A02)

Under study are the dynamics of phase separation in fluids, the intensity and spectral width of light scattered from a tricritical mixture, and the low-frequency flicker noise (1/f noise) in a binary mixture near its critical point. The variation of critical temperature with sample size in binary mixtures of varying composition will be measured. Finally, a collaborative exploratory venture into biochemistry is planned - a study of pH oscillations in enzyme-catalyzed reactions in an immobilized enzyme system.

This is a continuation of research supported by Grant No. DMR 73-05247.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0033, EXPERIMENTS ON GASES AT LOW TEMPERATURE

G.M. Seidel, Brown University, Graduate School, Dept. of Physics, *University Hall, Box 1883, Providence, Rhode Island* 02912 (DMR79-10006)

Research supported under NSF Grant No. DMR77-95593 will be continued with new emphasis being placed on the experimental problems associated with the production of a dense gas of spin-polarized atomic hydrogen. Such a gas has been predicted to a unique quantum mechanical system possessing unusual thermodynamical properties. A microwave discharge in a gas of molecular hydrogen will be used to dissociate the molecular hydrogen into atomic hydrogen. A helium-3, helium-4 dilution refrigerator will be used to cool the gas to temperatures as low as 0.1 degrees K after it has been spin-polarized by a high intensity magnetic field. The presence and density of the spin-polarized gas will be determined by superconducting microwave cavity techniques. The objective of this research is to study the stability of atomic hydrogen and, if stable, to study its many-body properties. Particular attention will be given to the question of the predicted Bose-Einstein condensation and possible superfluid state.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0034, DISSOCIATION OF FAST MOLECULAR HYDROGEN IONS ON NOBEL GASES

B.M. Doughty, East Texas State University, School of Science & Technology, Dept. of Physics, *E. Texas Station, Commerce, Texas* 75428 (T-561)

Cross-section measurements for 3s and 4s state hydrogen atom production by 10-150 keV H2 ions incident on Kr have been attempted with an experimental arrangement used previously for proton measurements. The experiment involves passing the beam through a 'thin' gas target cell and measuring Balmer radiations from the resulting fast hydrogen atoms in an evacuated flight tube. Production of ns state hydrogen atoms from H2 ions is more complicated than from proton projectiles both theoretically and experimentally. A new system has been constructed to alleviate several deficiencies in the proton apparatus. The new system has greater pumping speed, thus providing sharper gas boundaries and reduced background, or residual, emissions from the observation chamber. In addition, the beam can be observed in the collision region as well as in the evacuated observation chamber. This capability with the ability to monitor beam collisions with the wall of the collision chamber exit aperture provides a strong tool for investigating or eliminating aperture effects. Beam-aperture interactions have not been adequately studied in previous H2 ion measurements. Cross-sections

for production of 3p and 3d state hydrogen atoms will also be measured.

SUPPORTED BY Robert A. Welch Foundation

8.0035, DETERMINATION OF PROTON-INDUCED IONIZATION CROSS-SECTIONS OF SELECTED METALS
A.R. Zander, East Texas State University, School of Science & Technology, Dept. of Physics, *E. Texas Station, Commerce, Texas* 75428 (T-589)

Investigations of proton-induced ionization processes in thick metallic targets have been extended to proton energies below 100 keV. Values of absolute K-shell ionization cross-sections for incident protons for Z equals 20-30 metals have been obtained as a function of proton energy down to 60 keV. Comparison of the results to modified theoretical models for such collision processes appears to indicate that additional modifications may be required. The additional modifications may be dependent upon stopping power effects. This possibility is currently under investigation.

Additional studies of energetic heavy ions incident on various targets are under way in order to determine the relative contributions of one- and two-step vacancy production processes in such collisions. The results obtained to date are inconclusive due to relatively large radiative electron capture contributions.

SUPPORTED BY Robert A. Welch Foundation

8.0036, POSITRONIUM REACTIONS IN THERMOTROPIC LIQUID CRYSTALS AND OTHER MOLECULAR SUBSTANCES
J.D. McNutt, University of Texas, Arlington Campus, School of Science, Dept. of Physics, *Arlington, Texas* 76019 (Y-400)

The formation and reactions of positronium and the formation and properties of positronium compounds have been studied by measuring lifetime spectra for positrons annihilating in gases, and by measuring total cross-sections for the scattering of low-energy positrons from gas atoms. A complex temperature dependence, the first heretofore found for any gas, and a strong density dependence have been observed for the positronium yield in H2 gas at 293, 250, and 77 degrees K. O-Ps induced cavity formation occurs in 77K H2. The addition of concentrations of Ne to H2 at 77K strongly affects the formation probabilities for e plus H2 and for e plus (H2)n cluster states, the positronium yield, and the behavior of o-Ps in cavities. Preliminary results with C2H6 gas at 295K indicate the formation of e plus C2H6 at low gas densities, of e plus (C2H6)n cluster states at higher densities, positronium yields as high as 0.80, and the pronounced interaction of o-Ps with microscopic density inhomogeneities. Successful quantitative models have been developed for several of these effects; others remain unexplained. A monoenergetic, timed position beam has been utilized to accurately measure total scattering cross-sections for 2-75 eV positrons in Ne and Xe. The first measurement of positron-gas partial cross-sections has just been accomplished.

SUPPORTED BY Robert A. Welch Foundation

8.0037, MEASUREMENT OF THE COSMIC-RAY SIDEREAL ANISOTROPY ABOVE 1 TEV
H.E. Bergeson, Utah Higher Education System, University of Utah, School of Science, Dept. of Physics, *1400 E. 2nd S., Salt Lake City, Utah* 84112 (AST77-07627 A01)

An underground muon detector designed to measure the cosmic-ray sidereal anisotropy at galactic containment energies has been built in a mine near Heber, Utah. Three layers of plastic scintillators, totalling 37.3 sq. meters each, are located at a mean depth of 4.86 times 10 to the minus 4th power g cm to the minus second power. The median primary cosmic-ray rigidity is 1400 GV for detected events, and the counting rate exceeds 10 to the 8th power yr to the minus 1st power. A computer operates the experiment, performs periodic stability and calibration checks, and is also programmed to search for transient events and narrow-angle temporary anisotropies. The apparatus is complete and essentially operational. Continuous operation is expected in 1977. The sidereal anisotropy of cosmic rays will be measured for the next three years and the results reported.

This action provides additional funding and extends the duration of the grant number AST77 07627.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

8.0038, MATERIAL SUPPORT TECHNOLOGY - THIN FILMS, SURFACES, AND INTERFACES - A FOURIER-TRANSFORM THEORY OF THEIR ELECTRONIC STRUCTURE
H.J. Monkhorst, Utah Higher Education System, University of Utah, School of Science, Dept. of Physics, *1400 E. 2nd S., Salt Lake City, Utah* 84112 (DN775345; N00014-77-C-0319)

The Navy has need for improved performance solid-state electronic devices. One limitation has been a less than adequate understanding of the surface and interface physics of these devices. This program will assess new techniques for obtaining an understanding of these semiconductor surfaces and interfaces.

A new theoretrial approach is being developed for electronic structure calculations on thin films, surfaces and interfaces. The Fourier-transform technique developed for bulk solid calculations is being adapted into a two-dimensional version for application to surfaces. In the first stage, energies and electronic states are calculated at the Hartree-Fock level. At a later stage, electron correlation effects will be included. The properties for simple prototype solids will be calculated first and eventually applied to semiconductors. Various surface reconstruction effects in these materials will be considered.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0039, THEORETICAL STUDIES OF THE MAGNETIC PROPERTIES OF SOLIDS
D.L. Huber, University of Wisconsin, Madison Campus, School of Natural Sciences, Dept. of Physics, *Agriculture Hall, Madison, Wisconsin* 53706 (DMR79-04154)

Research previously supported by DMR7701057.

Theoretical research on the magnetic properties of solids will be carried out. The main emphasis will be on solids containing rare earth and transition metal ions. The specific projects to be pursued will include: 1) the calculation of the properties of rare earth magnets which focus on the dynamical behavior near a second order phase transition, 2) an investigation of the dynamics of quasi-one- and two-dimensional planar magnets, with a particular emphasis on effects which can be probed using ultrasonic, nuclear and paramagnetic resonant techniques, 3) the study of the properties of disordered magnets showing spin glass behavior, and 4) the investigation of energy transport among magnetic ions in paramagnetic crystals.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, MAGNITUDE AND VARIABILITY OF SOLAR SPECTRAL IRRADIANCE
G.E. Shaw, University of Alaska, Fairbanks Campus, School of Arts & Sciences, *Fairbanks, Alaska* 99701 (ATM78-12185)

Measurements of the absolute magnitude and variability of solar irradiance from ground stations are being recorded to determine if the sun's visible spectral irradiance is varying with time. The accuracy of the determination is expected to be 1% absolute, the precision (relative change) will be a few tenths of 1%. Because of improved calibration procedures these accuracies and precisions are about 5 times better than existing determinations. Solar variability, if it is observed, will be related to Zurich sunspot number, faculae indicies, solar flares and solar magnetic activity. In conjunction with measuring solar variability, aerosol spectral optical data will be collected at Mauna Loa.

These data will be related to sources and long range transport of aerosols accross the Pacific Ocean. Atmospheric ozone will also be studied by absorption of light in the Huggins and Chappuis bands.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

10.0002, IONOSPHERIC ACCELERATION MECHANISMS

R.D. Sharp, Lockheed Missiles & Space Co. Inc., Space Sciences Laboratory, *3251 Hanover St., Palo Alto, California* 94304 (ATM79-11174)

This grant will support the analysis of data from a plasma experiment on the S3-3 satellite. The satellite is in a polar elliptical orbit with apogee at 8000 km and is exploring a region of space which has not previously been studied. A number of new discoveries have already been made with the experiment relating to the processes responsible for the acceleration of auroral particles. The central focus of the proposed investigation will be the understanding of these mechanisms and the related processes that energize ionospheric ions and inject them into the magnetosphere. In particular, the data will be analyzed for evidence of electric fields in the polar ionosphere.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

10.0003, AN IMAGE-DISSECTOR SCANNER SYSTEM FOR THE MT. LEMMON OBSERVATORY

E.M. Burbidge, University of California, San Diego Campus, Graduate School, Dept. of Physics, *P.O. Box 109, La Jolla, California* 92037 (AST78-09228)

A modern spectrophotometric system will be constructed for the UCSD-Minnesota 1.5 meter telescope on Mt. Lemmon, Arizona. The system will consist of an image detector scanner module, a data acquisition computer system and an integrating television camera for guiding and setting on faint objects. An interactive data reduction system for use on the UCSD campus is also included. The instrument will be constructed by the Lick Observatory shops. The proposed image dissector scanner will have exceptional capabilities for research applications on galactic stars, gaseous nebulae, other galaxies and the strong sources of radio radiation known as Quasi Stellar Objects.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0004, OBJECTIVE-PRISM RADIAL VELOCITIES OF STARS

A.R. Upgren, Wesleyan University, School of Science in Society, Dept. of Astronomy, *Middleton, Connecticut* 06457 (INT78-19336)

This is a joint program between the Van Vleck Observatory of Wesleyan University, Middletown, Connecticut and the Fundacion Centro de Investigacion de Astronomia 'Francisco J. Duarte' in Merida, Venezuela, for the purpose of determining the radial velocities of groups of stars. Astronomers at the two observatories participate in the measuring, reduction and analysis of the results of the observations which are made in Venezuela. The observations consist of photographs taken with the wide-field Schmidt Telescope using an objective prism which causes each star to appear as a small spectrum. The precision of a PDS microdensitometer raster scan capabilities is being compared with more traditional but much slower machines now in use. If reliable enough, its use will increase the speed of measuring the spectral line, by an order of magnitude or more. The radial velocities of many thousands of stars can be determined only by this method. They can then be used to provide new and extensive information on the basic stellar components of our Milky Way Galaxy as well as its rotation. The new Venezuelan Schmidt Telescope has two unique advantages for this program; it is the largest in the world equipped with an objective prism and it is located near the Equator and thus can view all parts of the sky. The work contemplated is a continuation of research under a previous award, NSF No. OIP75-06683.

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Directorate for Scientific Technological
& Internat. Affairs, Div. of International
Programs

10.0005, PARALLAXES OF NORTHERN AND SOUTHERN STARS

A.R. Upgren, Wesleyan University, School of Science in Society, Dept. of Astronomy, *Middleton, Connecticut* 06457 (AST78-19007)

All methods for the determination of cosmic distances outside the solar system ultimately depend on trigonometric parallaxes of stars. This fundamental method is of such importance for the calibration of the distance to all objects in the Universe that its precision must be evaluated most carefully. Such parallaxes cannot be determined except over a number of years of careful observation. This program will continue analysis of the systematic and accidental errors of past parallaxes, and determine new ones as necessary to assist in this endeavor.

A systematic difference appears to exist between the stellar parallaxes observed in the Northern and Southern Hemispheres. It amounts to 0.005 plus or minus 0.001 but its cause is unknown. Since the latitudes of the northern and southern observatories differ by more than 60 degrees, an astrometric telescope located near the Equator would be helpful in resolving the difference and identifying its cause. The new 65-cm refractor now in operation near Merida, Venzuela at latitude 8 degrees 48'N will be used to make parallax observations which could resolve the difference. In addition, parallaxes of some stars of individual interest will be observed there, mostly at deep southern declinations where no precise parallaxes are presently available. Studies on the origin and nature of existing differences between observations are already in progress and form a part of this program.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0006, A STUDY OF THE NEEDS OF ASTRONOMY AND ASTROPHYSICS FOR THE 1980'S

B.N. Gregory, National Academy of Sciences, *2101 Constitution Ave. N.W., Washington, District of Columbia* 20037 (C-AST78-28089)

The National Research Council of the National Academy of Sciences proposes to conduct a two-year study of the needs of astronomy and astrophysics, incorporating both ground-based and space investigations, for the 1980's. The study would be concerned with all aspects of observational astronomy (understood to include all regions of the electromagnetic spectrum, from radio waves to gamma rays; particle radiations; including neutrinos and muons; and gravitational waves) and laboratory astrophysics. The field of theoretical astrophysics and relativity would also be surveyed, as well as solar physics and planetary studies. The major goal of the study would be to formulate priorities for a comprehensive program in astronomy and astrophysics for the 1980's. This would be based upon studies of the following type: a review of the influence of the Greenstein Report on the development of astronomy and astrophysics during the 1970's; and examination of the advances in facilities design, technology, and management procedures since publication of the Greenstein Report, and hence to delineate the major astronomical and astrophysical problems to be addressed in the 1980's; an assessment of the extent to which current or approved facilities and programs will be able to meet the scientific challenges of the coming decade; a determination of what new facilities and programs will be needed to meet the scientific challenges of the coming decade. A report will be submitted at the end of the study.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0007, OBSERVATIONAL PROGRAM IN GROUND-BASED INFRARED ASTRONOMY

E. Becklin, University of Hawaii System, Manoa Campus, Inst. for Astronomy, *2840 Kolowalu St., Honolulu, Hawaii* 96822 (AST78-26028)

An observational program in ground-based infrared astronomy using the facilities of Mauna Kea, Hawaii, Observatory will be carried out. The program will consist principally of photometric observations in the atmospheric windows between 1 and 40 microns of both galactic and extragalactic sources. Initially the program would use the 2.2-m telescope, but later would employ both the 3.8-m United Kingdom and 3-m National Aeronautics and Space Administration's infrared telescopes. Within the Galaxy the earlier Cal. Tech. work on ionized hydrogen (HII) regions and molecular clouds, with particular reference at this time to very cool infrared sources, usual HII regions and infrared reflection nebulosity will be continued. Outside of the galaxy the research will be directed to the question of the nature of the strong infrared emission from the nuclei of certain galaxies. In both programs full advantage will be taken of Mauna Kea's excellent atmospheric transmission to emphasize observations at wavelengths longward of 10 microns. These observations will be complemented with 2-10 microns mapping and photometry and 2-4 microns filter-wheel spectrophotometry. Aperture synthesis radio observations of some of our infrared sources will be made at the very large array and the Cambridge, England five kilometer telescope.

SUPPORTED BY U.S. National Science Foundation,
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10.0008, OBSERVATIONAL STUDIES OF THE SPECTROPHOTOMETRY OF QUIESCENT SOLAR PROMINENCES

D.A. Landman, University of Hawaii System, Manoa Campus, Inst. for Astronomy, *2840 Kolowalu St., Honolulu, Hawaii* 96822 (AST78-19006)

The study of quiescent prominences is important in other problems in solar physics, solar-terrestrial relations, and in other fields of astronomy. Prominences are luminous streamers, arches, and clouds of plasma observed above the edge of the sun extending into the chromosphere and corona. The ones to be studied are those which remain relatively quiescent. A proper understanding of the conditions in these prominences will lead eventually to an accurate determination of the helium to hydrogen abundance ratio, which is otherwise difficult to determine. This value will bear ultimately on the He to H ratio of the universe, and hence on all areas of astronomy. Information will also be gained on the magnetic fields and possibly on the mechanism of coronal heating. The observations made on the oscillations and perturbations of the material as seen in the spectra can be used to investigate the dynamics of energy propagation in the inner corona. Understanding of the ionization and excitation equilibrium of the prominences remains unsatisfactory. It is the study of this problem and of the discrepancies between the previous observations and the theoretical calculations that is the goal of the research to be carried out in this project.

SUPPORTED BY U.S. National Science Foundation,
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10.0009, ASTRONOMICAL APPLICATIONS OF NEAR-INFRARED VIDICONS

R.K. Honeycutt, Indiana University, Bloomington Campus, School of Arts & Sciences, Dept. of Astronomy, *Memorial Hall, Bloomington, Indiana* 47401 (AST79-07552)

Astronomical research in the infrared has been hampered by the low sensitivity of most available imaging devices. A low light level integrating television system was designed and built at the Los Alamos Scientific Laboratory in 1976 and later duplicated at Indiana University by the principal investigator and his co-workers. This device is based on an RCA S-1 I-SIT vidicon. It will be used for several studies including time-resolved spectroscopy of several stars being observed simultaneously in the X-ray part of the spectrum by the high energy astrophysical observatory (HEAO-A) satellite. Observations will include binary stars suspected of having acretion rings, gas shells surrounding late-type stars, objects more readily visible in the infrared that are heavily obscured by dust in the visible wavelengths, and a number of external galaxies. Images have already been obtained and others are stored at Los Alamos. These and the images to be obtained at the Goethe-Link Observatory in Indiana will be analyzed with the new image analysis system at Indiana University. To facilitate the work at Goethe-Link, several items of hardware will be obtained or constructed. The hardware includes a second microcomputer to separate the telescope control and observing functions presently shared by a single microcomputer, a stellar gas shell filter, and an automatic guider for the telescope.

SUPPORTED BY U.S. National Science Foundation,
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10.0010, INVESTIGATIONS OF GALACTIC STRUCTURE

F.J. Kerr, University of Maryland, College Park Campus, School of Arts & Sciences, Dept. of Physics & Astronomy, *College Park, Maryland* 20742 (AST77-26898 A01)

The data from a 21-cm radio astronomy survey of the Southern Milky Way with the 64 meter Parkes telescope are being prepared for publication. The more extensive data from a companion survey with the 18 meter telescope are available as profiles, and will be in contour map form in the Spring, 1979. Some studies of these data have begun, including a new delineation of the warp of the Galaxy. A wide range of other investigations will be based on the Milky Way data. In addition, there are results from a 21-cm survey of the galactic center region. The third quadrant of galactic longitude is being studied optically and in various types of radio emission. A detailed 21-cm study of the Puppis window will be done, for comparisons between stars and gas. The results from an Arecibo Observatory study of distant spiral galaxies provide a statistically large sample of galaxies. Many of the galaxies detected at 21-cm will be photographed, in order to correlate the shape of the global profiles with features in theoretcal appearance.

This is a continuation of work being done under AST-7726898.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0011, SOLAR FLARES AND THEIR INTERPLANETARY EFFECTS

D.M. Rust, American Science & Engineering Inc., Space Division, *955 Massachusetts Ave., Cambridge, Massachusetts* 02139 (ATM79-18412)

This grant will support the development and implementation of the scientific programs of the International Solar Maximum Year. These include the Flare Build-up Study (FBS), The Study of Energy Release in Flares (SERF) and the Study of Travelling Interplanetary Phenomena (STIP). A major goal is to identify problems that will yield to a coordinated attack by combined measurements; of the interplanetary medium, for example, and observations of solar ejections. A Science Coordinator will perform the following tasks, as formulated by the Workshop on Energy Release in Flares and endorsed by the SMY Steering Committee: (a) provide a central focus for the communication of detailed observational plans and priorities between observatories (ground and space-borne), (b) assist in the development of the plans to carry out coordinated observing sequences, and (c) assist in the coordination of the scientific goals of the individual ground and space-borne observatories toward the ultimate goal of maximizing the collective science. Coordinated observations will be carred out during approximately thirty-five 3-4 day intervals per year. Between intervals, observations received will be evaluated, the scientific programs refined and results publicized. As time allows, a particular program to study flares with eruptive filaments will be pursued. Flares with eruptive filaments invariably result in stronger inter-

planetary and geophysical disturbances than noneruptive flares and are therefore of particular interest to solar-terrestrial physics.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
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of Atmospheric Sciences

10.0012, HYDRODYNAMIC CONVECTION IN THE CORE HELIUM FLASH

R.G. Deupree, Boston University, School of Liberal Arts, Dept. of Astronomy, *755 Commonwealth Ave., Boston, Massachusetts* 02215 (AST79-05568)

The helium core flash is the event which signifies the thermonuclear ignition of helium in the central region of a star. The problems associated with this phenomenon are the inclusion of time-dependent turbulent convection, the interaction of the convective energy transport and the local nuclear heating, and the mixing and transport of material produced by these thermonuclear reactions.

The research to be carried out will involve calculations of the thermonuclear ignition of helium, making use of computer codes capable of carrying out the calculation in two spatial dimensions. These calculations will be aimed at defining the nature of the interaction of these features. Such calculations will provide information on the validity of techniques currently used in the treatment of convection, turbulence, and mixing.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0013, VARIABLE STARS

E.P. Belserene, Maria Mitchell Observatory, *Nantucket, Massachusetts* 02554 (AST78-07405 A01)

The photographic plate collection of the Maria Mitchell Observatory is almost unique as a resource for the investigation of changing periods of pulsating variable stars. During the summer and fall of 1979 over 100 plates will be taken with the telescope at this Observatory. These plates will be analyzed to determine the behavior of variable stars in selected regions of the Galaxy. The Observatory will also provide data on the past optical behavior of astronomical objects of interest to spectroscopists and astronomers.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
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of Astronomical Sciences

10.0014, A TWO-FREQUENCY VLBI EXPERIMENT

J.M. Moran, Smithsonian Institution, Astrophysical Observatory, *60 Garden St., Cambridge, Massachusetts* 02138

Very long baseline interferometry experiments were conducted to determine the spatial structure of molecular line emission from galactic radio sources. Some funds were diverted to the Spectral Lines Project for purchase of equipment.

SUPPORTED BY Smithsonian Institution, Astrophysical
Observatory

10.0015, PETROLOGICAL AND MINERALOGICAL STUDIES

J. Wood, Smithsonian Institution, Astrophysical Observatory, *60 Garden St., Cambridge, Massachusetts* 02138 (31P-4P50-02)

Comprehensive studies are made of solid extraterrestrial material including returned lunar soil samples and meteorites by techniques of mineralogy and petrology, optical microscopy, X-ray diffraction, electron-probe microanalysis and scanning electron microscopy. Petrological studies lead to deductions about the origin and evolution of these materials.

SUPPORTED BY Smithsonian Institution, Astrophysical
Observatory

10.0016, COMPUTER-CONTROLLED PHOTOGRAPHIC PHOTOMETRY SYSTEM

E.L. Turner, Princeton University, Graduate School, Dept. of Astrophysical Sciences, *205 Nassau Hall, Princeton, New Jersey* 08540 (AST78-22484)

This project will provide a PDS microdensitometer data acquisition facility for the Department of Astrophysical Sciences at Princeton University. The system consists of a minicomputer controlled instrument which translates photographic density (lightness and darkness) of each point in the picture. These numbers are stored on magnetic tape and later analyzed with a large computer or an interactive picture processing system. When applied to a photograph of some part of the sky taken through a large telescope, this process allows the determination of accurate brightnesses, positions in the sky, shapes, colors, etc. of various celestial objects.

The system will be a powerful facility which will be used by astronomers from Princeton as well as from other institutions in the area. Some of the projects include locating and studying galaxies outside our own. Clusters of galaxies and quasi-stellar objects will also be studied in order to answer questions concerning the nature, origin, evolution and structure of these largest and most distant objects in our universe.

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10.0017, HIGH DISPERSION SPECTROSCOPIC STUDIES OF GASEOUS NEBULAE IN THE REGION FROM 4000 TO 8500 A

S.J. Czyzak, Ohio State University, Columbus Campus, School of Mathematics & Physical Sciences, Dept. of Astronomy, *164 W. 17th Ave., Columbus, Ohio* 43210 (AST76-15727 A02)

The spectrum of several planetary nebulae will be measured using sensitive equipment of the latest type. The device used will be the Schectman spectrometer mounted on the 5 meter telescope at Mt. Palomar, along with other instruments at Cerro Tololo Interamerican Observatory in Chile and Perkins Observatory in Ohio. The unique measurements to be made are accurate intensities of lines in the spectra of a few nebulae which can be used as indicators of what is to be expected in the ultra-violet spectrum of these objects. The measurement of ultraviolet light requires satellite observations, while the above observations can be done from the ground. The data obtained will improve knowledge of chemical compositions, the structure of the nebulae, and set standards with which other nebulae can be compared.

SUPPORTED BY U.S. National Science Foundation,
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10.0018, IDENTIFICATION AND PHOTOMETRY OF QUASI-STELLAR OBJECTS IN SELECTED HIGH-LATITUDE FIELDS

P.D. Usher, Pennsylvania State University, University Park Campus, School of Science, Dept. of Astronomy, *211 Whitmore Lab., University Park, Pennsylvania* 16802 (AST78-21498)

The criterion of ultraviolet and infrared color excess and optical variability will be used to identify candidate quasi-stellar objects (QSOs) brighter than R approximately 20 magnitude in 10 Kapteyn Selected Areas at high galactic latitude. Variability and red or infrared excess will be used to separate QSOs from white dwarfs. The Selected Areas are centered on smaller faint-limit fields currently under investigation by Sandage. The research will supplement the faint-limit fields and provide further information toward problems of the isotropy and the spatial density of QSOs.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0019, RADIO ASTRONOMICAL OBSERVATIONS OF TWENTY-ONE CENTIMETER ABSORPTION LINES IN QUASI-STELLAR OBJECTS

A.M. Wolfe, University of Pittsburgh, School of Arts & Sciences, Dept. of Physics & Astronomy, *4200 5th Ave., Pittsburgh, Pennsylvania* 15260 (AST79-07760)

The aim of this research is to study quasi-stellar objects (QSO or quasar) absorption-line systems by observing the 21 cm wavelength line of hydrogen. The 21 cm absorption lines serve as valuable probes in the extremely distant clouds in which they form for the following reasons: 1) the detection of 21 cm and Lyman alpha absorption at the same redshift allows one to deduce the excitation temperature of the absorption gas, which is an indicator of the proximity of the absorber to the background QSO; 2) Observations of 21 cm absorption lines with very-long-baseline (VLB) interferometers reveal information about the spatial extent of the absorbing gas across scales large enough to reflect spatial and kinematical properties peculiar to a galaxy; 3) the high spectral resolution available from radio autocorrelation spectrometers permit one to record the kinematics of the absorber in detail; and 4) the coincidence of 21 cm and optical absorption lines at the same redshift lead to serve upper limits on the variations of certain physical constants over cosmological time-scales. This is a continuation of AST-7615202A01.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0020, INVESTIGATION OF BINARY AND MULTIPLE STARS

D.S. Evans, University of Texas, Austin Campus, School of Arts & Sciences, Dept. of Astronomy, *200 W. 21st, Austin, Texas 78712 (AST78-22483)*

Investigations will be carried out of binary, multiple and possibly some single stars, using the visual surface brightness relation established by Barnes and Evans, and some other techniques. The results should provide measures of distances of structures within our own galaxy and even possibly in the Magellanic Clouds. They should improve definition of the Barnes-Evans relation in the critical region needed for the determination of distances and absolute magnitudes of variable stars with implications for galactic structure. They should provide data leading to better understanding of the formation, rotational properties and evolution dynamics of multiple stars, and also basic data for evolution of single stars.

Prior support was by NSF grant AST 77-01360 A01.

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Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0021, SPECTROSCOPIC OBSERVATIONS OF QUASI-STELLAR OBJECTS

B.J. Wills, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Astronomy, *200 W. 21st St., Austin, Texas* 78712 (AST79-01182)

The University of Texas Radio Astronomy Observatory is engaged in a deep radio source survey (5000 sources per steradian), providing arc-second positional accuracy for the sources, which can then be optically identified with quasi-stellar objects (QSOs) and galaxies using even more accurate optical positions. The spectroscopic and other optical work on the identified radio sources will be continued. Telescopes at the University of Texas' McDonald Observatory, where linear detectors (a Self-Scanned Digicon and an Intensified Dissector Scanner) are now in routine operation, will be used. Principal programs include the study of large samples of bright and faint QSOs, which may be used to investigate the space density and luminosity evolution of QSOs, for quantitative statistical studies of line strengths and their dependence on redshift and other QSO properties, and for studies of interesting individual objects, such as the BL Lac-type ('lineless') objects, the extremely compact N galaxies and Seyfert-type nuclei, and QSOs with complex absorption-line spectra. Monitoring the emission-line strengths of some optically-variable QSOs, to constrain models of the geometry and physical conditions that occur in the broad line regions, will be continued. This work is a continuation of AST-7681338A01.

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Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N80-20223*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

TECHNOLOGY REQUIREMENTS AND READINESS FOR VERY LARGE AIRCRAFT

D. William Conner and John C. Vaughan, III Mar. 1980 14 p refs

(NASA-TM-81783) Avail: NTIS HC A02/MF A01 CSCL 01B

Common concerns of very large aircraft in the areas of economics, transportation system interfaces and operational problems were reviewed regarding their influence on vehicle configurations and technology. Fifty-four technology requirements were identified which are judged to be unique, or particularly critical, to very large aircraft. The requirements were about equally divided among the four general areas of aerodynamics, propulsion and acoustics, structures, and vehicle systems and operations. The state of technology readiness was judged to be poor to fair for slightly more than one-half of the requirements. In the classic disciplinary areas, the state of technology readiness appears to be more advanced than for vehicle systems and operations.

Author

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also 34 Fluid Mechanics and Heat Transfer.

N80-20224* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

DETECTION OF THE TRANSITIONAL LAYER BETWEEN LAMINAR AND TURBULENT FLOW AREAS ON A WING SURFACE Patent

William R. Hood Issued 19 Feb. 1980 4 p Filed 27 Nov. 1978 Supersedes N79-16805 (17 - 08, p 0932)

(NASA-Case-LAR-12261-1; US-Patent-4,188,823; US-Patent-Appl-SN-964009; US-Patent-Class-73-147; US-Patent-Class-73-205L) Avail: US Patent and Trademark Office CSCL 01A

A system is disclosed for detecting the laminar to turbulent boundary layer transition on a surface while simultaneously taking pressure measurements. The system uses an accelerometer for producing electrical signals proportional to the noise levels along the surface and a transducer for producing electrical signals proportional to pressure along the surface. The signals generated by the accelerometer and transducer are sent to a data reduction system for interpretation and storage.

Official Gazette of the U.S. Patent and Trademark Office

N80-20225 Engineering Sciences Data Unit, London (England).

EXAMPLE OF PERFORMANCE ANALYSIS USING DATA OBTAINED CONCURRENTLY IN AIR-PATH, BODY AND EARTH AXES

1979 31 p

(ESDU-79018; ISBN-0-85679-263-2) Copyright. For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $674.50

A detailed work example of the application of the equations of motion to the solution of problems in aircraft point-performance work involving the use of several axis systems is presented. The example is the determination of lift and drag for a supersonic-cruise aircraft using data from air-data systems, bodymounted accelerometers and an inertial platform system. A particular feature is the extent to which account is taken of quantities which individually might be regarded as negligible but whose collective effects in an attempted high-accuracy analysis can be significant.

ESDU

N80-20226 State Univ. of New York at Buffalo.

STABILITY AND TRANSITION OF WAVE INDUCED BOUNDARY LAYER FLOWS Ph.D. Thesis

Yehia Mahmoud Amr 1979 157 p

Avail: Univ. Microfilms Order No. 8005630

A theoretical investigation of stability and an experimental investigation of transition of wall boundary layers developed within unsteady plane expansion waves and behind shock waves traveling into a gas at rest are discussed. The theoretical investigation involved three tasks: the use of approximate methods for the prediction of critical Reynolds numbers, a numerical integration of the Orr-Sommerfeld equation for the incompressible boundary layer flow at the expansion wave head, and the development of a multiple scales technique for nearly quasisteady, quasiparallel boundary layer flows. Thin film surface thermometers, flush hot film anemometers, and hot wire anemometers were used independently and simultaneously to detect boundary layer transition.

Dissert. Abstr.

N80-20227*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

A SPIN-RECOVERY PARACHUTE SYSTEM FOR LIGHT GENERAL-AVIATION AIRPLANES

Charles Bradshaw Apr. 1980 18 p refs Presented at the 14th Aerospace Mech. Symp., Hampton, Va. 1-2 May 1980 Submitted for publication

(NASA-TM-80237; L-13585) Avail: NTIS HC A02/MF A01 CSCL 01A

A tail mounted spin recovery parachute system was designed and developed by the NASA Langley Research Center for use on light general aviation airplanes. The system was designed for use on typical airplane configurations, including low wing, single engine, and twin-engine design. A mechanically triggered pyrotechnic slug gun is used to forcibly deploy a pilot parachute which extracts a bag that deploys a ring slot spin recovery parachute. The total system weighs 8.2 kg (18 lb). System design factors included airplane wake effects on parachute deployment, prevention of premature parachute

deployment, positive parachute jettison, compact size, low weight, system reliability, and pilot and ground crew safety. Extensive ground tests were conducted to qualify the system. The recovery parachute was used successfully in flight 17 times. J.M.S.

N80-20228*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TRANSONIC UNSTEADY AIRLOADS ON AN ENERGY EFFICIENT TRANSPORT WING WITH OSCILLATING CONTROL SURFACES
M. C. Sandford, R. H. Ricketts, F. W. Cazier, Jr., and H. J. Cunningham Feb. 1980 9 p
(NASA-TM-81788) Avail: NTIS HC A02/MF A01 CSCL 01A

An aspect ratio 10.8 supercritical wing with oscillating control surfaces is described. The wing is instrumental with 252 static orifices and 164 in situ dynamic pressure transducers for studying the effects of control surface deflection on steady and unsteady pressures at transonic speeds. Results from initial wind tunnel tests conducted in the Langley Transonic Dynamics Tunnel are discussed. Unsteady pressure results are presented for two trailing edge control surfaces oscillating separately at the design Mach number of 0.78. Some experimental results are compared with analytical results obtained by using linear lifting surface theory. Author

N80-20229*# National Aeronautics and Space Administration, Washington, D. C.
ON WINGS OF CIRCULAR DESIGN
Wilhelm Kinner Oct. 1979 7 p refs Transl. into ENGLISH from Z. Angew. Math. Mech. (East Germany), v. 16, no. 5, Dec. 1936 p 349-352 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75505) Avail: NTIS HC A02/MF A01 CSCL 01A

Prandtl's method of sources and sinks for air foils is used to investigate the aerodynamics of circular wings in constant flow. Lift distribution, total lift, and pitching moment are investigated as well as the influence of changes in the angle of attack. Author

N80-20230*# Remtech, Inc., Huntsville, Ala.
WAKE FLOWFIELDS FOR JOVIAN PROBE Final Report
Carl D. Engel and Leroy M. Hair Hampton, Va. NASA Langley Research Center Mar. 1980 62 p refs
(Contract NAS1-15819)
(NASA-CR-159235) Avail: NTIS HC A04/MF A01 CSCL 01A

The wake flow field developed by the Galileo probe as it enters the Jovian atmosphere was modeled. The wake produced by the probe is highly energetic, yielding both convective and radiative heat inputs to the base of the probe. A component mathematical model for the inviscid near and far wake, the viscous near and far wake, and near wake recirculation zone was developed. Equilibrium thermodynamics were used for both the ablation and atmospheric species. Flow fields for three entry conditions were calculated. The near viscous wave was found to exhibit a variable axial pressure distribution with the neck pressure approximately three times the base pressure. Peak wake flow field temperatures were found to be in proportion to forebody post shock temperatures. J.M.S.

N80-20231*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
OPERATIONAL IMPLICATIONS OF SOME NACA/NASA ROTARY WING INDUCED VELOCITY STUDIES
Harry H. Heyson Feb. 1980 53 p refs Presented at 3d Midwest Helicopter Safety Seminar, Joliet, Ill., 26-27 Feb., 1980; sponsored by FAA and Ill. Dept. of Transportation.
(NASA-TM-80232) Avail: NTIS HC A04/MF A01 CSCL 01A

Wind tunnel measurements show that the wake of a rotor, except at near-hovering speeds, is not like that of a propeller. The wake is more like that of a wing except that, because of the slow speeds, the wake velocities may be much greater. The helicopter can produce a wake hazard to following light aircraft that is disproportionately great compared to an equivalent fixed-wing aircraft. This hazard should be recognized by both pilots and airport controllers when operating in congested areas. Even simple momentum theory shows that, in autorotation and partial-power descent, the required power is a complex function of both airspeed and descent angle. The nonlinear characteristic, together with an almost total lack of usable instrumentation at low airspeeds, has led to numerous power-settling accidents. The same theory shows that there is a minimum forward speed at which a rotor can autorotate. Neglect of, or inadequate appraisal of this minimum speed has also led to numerous accidents. Ground effect and the problems it creates is discussed. R.E.S.

N80-20232*# Kentron International, Inc., Hampton, Va.
AERODYNAMIC DESIGN AND ANALYSIS OF THE AST-204, AST-205, AND AST-206 BLENDED WING-FUSE LARGE SUPERSONIC TRANSPORT CONFIGURATION CONCEPTS
Glen L. Martin and Kenneth B. Walkley Mar. 1980 49 p refs
(Contract NAS1-16000)
(NASA-CR-159223) Avail: NTIS HC A03/MF A01 CSCL 01A

The aerodynamic design and analysis of three blended wing-fuselage supersonic cruise configurations providing four, five, and six abreast seating was conducted using a previously designed supersonic cruise configuration as the baseline. The five abreast configuration was optimized for wave drag at a Mach number of 2.7. The four and six abreast configurations were also optimized at Mach 2.7, but with the added constraint that the majority of their structure be common with the five abreast configuration. Analysis of the three configurations indicated an improvement of 6.0, 7.5, and 7.7 percent in cruise lift-to-drag ratio over the baseline configuration for the four, five, and six abreast configurations, respectively. R.E.S.

N80-20233# ARO, Inc., Arnold Air Force Station, Tenn.
LASER-RAMAN MEASUREMENTS IN A DUCTED, TWO-STREAM, SUBSONIC, H2/AIR COMBUSTION FLOW Final Report, 5 Sep. 1978 - 13 Aug. 1979
W. D. Williams, H. M. Powell, L. L. Price, and G. D. Smith AEDC Dec. 1979 63 p refs Sponsored by AF
(AD-A078112; AEDC-TR-79-74) Avail: NTIS HC A04/MF A01 CSCL 20/5

The laser-Raman diagnostic technique has been used for investigating a ducted, two-stream, subsonic, H2/air combustion flow with turbulent jet mixing and recirculation. A primary jet of high-velocity air was surrounded by an outer, low-velocity hydrogen stream. The duct-to-inner-nozzle diameter ratio was varied. The ratios were 2 and 10 for the two conditions investigated. The radial distributions of static temperature and species number densities were determined at several axial positions for each test condition. GRA

N80-20234# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio. Aeromechanics Div.
INVESTIGATION OF NUMERICAL TECHNIQUES FOR PREDICTING AERODYNAMIC HEATING TO FLIGHT VEHICLES Final Report, May 1975 - Sep. 1977
Arthur B. Lewis, Jr. and Neil J. Sliski May 1979 120 p refs (AF Proj. 2404)
(AD-A078121; AFFDL-TR-79-3001) Avail: NTIS HC A06/MF A01 CSCL 20/4

The development of complex lifting configurations and high speed maneuvering vehicles has emphasized the need for numerical techniques to predict aerodynamic heating rates as a function of the vehicle trajectory. These numerical programs are not expected to eliminate the requirements for wind tunnel and flight testing, but will be an aid to more efficient use of experimentation time and improve confidence that all potential problem areas on the vehicle have been examined. Three programs, the Hypersonic Arbitrary Body Program, the MINIVER Program, and a third program were examined to determine their usefulness for vehicles with non-circular cross sections and large flat areas as exemplified by lifting reentry vehicles. The MINIVER code was found to be unsuitable for this; the Hypersonic Arbitrary Body Program was applicable to these shapes, but because of program limitations was used for only limited calculations. The last program also had limitations in the areas of geometry description and surface pressure calculations. Efforts were made

to remove these limitations and several shapes were investigated. The ultimate goal of this effort was to extend the capabilities of one or more of the heating codes; while no effort was made to improve MINIVER or the Hypersonic Arbitrary Body Program, significant improvements were made in the last program and inviscid flow field program. GRA

N80-20235# ARO, Inc., Arnold Air Force Station, Tenn.

AERODYNAMIC CHARACTERISTICS AND STORE LOADS OF THE 1/24-SCALE F-111 AIRCRAFT MODEL WITH SEVERAL EXTERNAL STORE LOADINGS Final Report, 18-23 Jun. 1979

C. F. Anderson AEDC Aug. 1979 48 p
(AD-A078677; AEDC-TSR-79-P48) Avail: NTIS
HC A03/MF A01 CSCL 20/4

The 1/24-scale F-111 aircraft model was tested to obtain simultaneous measurements of the aircraft and store aerodynamic loads and to evaluate the effects of the TAWDS pod on aircraft stability and control. Static stability and store loads data were obtained at 5 wing sweep angles for Mach numbers from 0.4 to 1.2. Data were also obtained for stabilizer deflections of + or - 10 deg and with the speed brake deflected 50 deg for some configurations. The angle of attack range was from -2 to 24 deg and the angle of sideslip range was from -10 to 10 deg. GRA

N80-20236# Nielsen Engineering and Research, Inc., Mountain View, Calif.

THE DEVELOPMENT OF RAPID PREDICTIVE METHODS FOR THREE-DIMENSIONAL TRANSONIC FLOW FIELDS ABOUT FIGHTER BOMBER AIRCRAFT, PART 1 Final Report, 1 Jan. 1975 - 30 Sep. 1979

Anthony J. Crisalli, Stephen S. Stahara, Jack N. Nielsen, and John R. Spreiter Jul. 1979 314 p refs
(Contract F44620-75-C-0047; AF Proj. 2307)
(AD-A078683; NEAR-TR-198; AFOSR-79-1281TR) Avail: NTIS HC A14/MF A01 CSCL 20/4

This report presents an overall account of the progress made on an essential component of the transonic store trajectory problem: the predicton of transonic flow fields about wing-body/pylon combinations representative of modern fighter-bomber aircraft. The emphasis here is on the development of predictive techniques which are sufficiently economical from the standpoint of computer cost to enable an aircraft designer to employ the techniques over a wide range of Mach number, angle of attack, and geometric parameters. The report presents several candidate transonic predictive methods and evaluates them by comparing their predictions of various flow field quantities with experimental data. The experimental data are taken from a parallel wind-tunnel test phase of the project, designed specifically for evaluating the predictive methods. The experimental data have been documented and archived in several test reports. The extensive comparisons of the theoretical predictions from the various predictive methods with the data comprise the major portion of this report. GRA

N80-20237# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

GROUND PLANE EFFECTS ON A CONTOURED SURFACE AT LOW SUBSONIC VELOCITIES M.S. Thesis

J. A. Krawtz Dec. 1979 115 p refs
(AD-A079877; AFIT/GA/AA/80M-3) Avail: NTIS
HC A06/MF A01 CSCL 20/4

The wing-in-ground effect phenomenon was examined by investigating the flow between a flat ground plate and a contoured upper plate. Velocity and turbulence intensity measurements were taken at various points in the flow with a Laser Doppler Velocimeter. Mach numbers studied were Mach 0.15 and Mach 0.2 at the exit plane of a 1 cm by 10 cm two-dimensional nozzle. Measurements were taken across the width of the jet, 5, 10, and 15 cm downstream with plate separations of 1, 2, and 5 cm and vertically without the ground plate. In addition measurements were taken near the top plate with conventional pressure measuring techniques and the results compared. The proximity of the ground plate had the effect of spreading the flow outward across the 10 cm width of the jet by 20%. The laser velocimeter showed the turbulence intensity to be constant across the potential core of the jet. Turbulence intensity increased beyond 10% in the boundary layers of the jet and in the plate boundary layer. The pressure measurement data correlated well with the laser velocimeter results. GRA

N80-20238# ARO, Inc., Arnold Air Force Station, Tenn.

COMPUTATION OF AXISYMMETRIC SEPARATED NOZZLE-AFTERBODY FLOW Final Report, 1 Oct. 1977 - 30 Jul. 1979

J. L. Jacocks AEDC Jan. 1980 31 p refs
(AD-A079894; AEDC-TR-79-71) Avail: NTIS
HC A03/MF A01 CSCL 20/4

The development of a computer program for solving the compressible, axisymmetric, mass-averaged Navier-Stokes equations is described. The basic numerical algorithm is the MacCormack explicit predictor-corrector scheme. Turbulence modeling is accomplished using an algebraic, two-layer eddy viscosity model with a novel modification dependent on the streamwise gradient of vorticity. Comparisons of computed results with experimental data are presented for several nozzle-afterbody configurations with either or simulated plumes. GRA

N80-20239# Wright State Univ., Dayton, Ohio. Dept. of Engineering.

AN APPROXIMATE ANALYSIS OF WING UNSTEADY AERODYNAMICS Final Report, 1 Sep. 1976 - 31 Jan. 1978

W. R. Wells May 1979 44 p refs
(Contract F33615-76-C-3145; AF Proj. 2307)
(AD-A079322; AFFDL-TR-79-3046) Avail: NTIS
HC A03/MF A01 CSCL 20/4

A brief review of the unsteady aerodynamics in lifting surface theory is reported. For utility in design application, simplified but accurate analytical expressions were developed for generalized unsteady aerodynamics of wings of finite aspect ratio and sweep. This includes a means of calculating the unsteady lift load on the wing and tail surface of arbitrary shape and angle of attack variation. In addition, a formulation to include the indicial aerodynamics in the longitudinal equations of motion of the aircraft was performed. Sample numerical solutions to the longitudinal equations for a step input in elevator deflection are presented for the Navion aircraft. From these calculations, a noted difference in angle of attack and pitch rate response can be seen for the cases of unsteady and quasi-steady aerodynamics. The apparent increase in damping effects in the aircraft response due to the unsteady aerodynamics indicate that various design constraints might be relaxed somewhat if the unsteady aerodynamics is modeled properly. GRA

N80-20240# Martin Marietta Labs., Baltimore, Md.

COMPUTATION OF THREE-DIMENSIONAL AERODYNAMIC FLOW Final Report, 1 Jul. 1978 - 31 Jan. 1980

K. C. Wang Jan. 1980 10 p refs
(Contract F49620-76-C-0004; AF Proj. 2304)
(AD-A080073; AFOSR-80-0034TR) Avail: NTIS
HC A02/MF A01 CSCL 20/4

The present contract continues an earlier one which extended from 1970-1976, F44620-70-C-0085. The purpose of this continued action was to make pioneering calculations of genuine three-dimensional laminar boundary layers. During the current contract period, efforts were first focused on investigations of: (1) the general characteristics of three-dimensional flow separation, especially for aerospace applications and (2) the boundary layer features and the magnus forces on spinning bodies such as spinning projectiles or missiles. Later emphasis gradually shifted to the boundary layer over an aircraft wing in contrast to that around a body of revolution studied theretofore. GRA

N80-20241# ARO, Inc., Arnold Air Force Station, Tenn.

REAL-GAS EFFECTS ON THE AERODYNAMICS OF BLUNT CONES AS MEASURED IN A HYPERVELOCITY RANGE Final Report, Jul. 1975 - Oct. 1978

C. J. Welsh, W. R. Lawrence, and R. M. Watt AEDC Oct. 1979 29 p refs
(AD-A075526; AEDC-TR-79-33) Avail: NTIS
HC A03/MF A01 CSCL 20/4

A 1,000-ft hypervelocity range was used in a free-flight investigation of real-gas effects on the aerodynamics of blunted 10-deg semiangle cones. The tests were made using nitrogen

and air test environments at a nominal velocity of 16,000 fps and at Reynolds number levels (based on model length and free-stream conditions) of about 400,000 and 2,000,000. Measurements indicate appreciable real-gas effects in the center-of-pressure and moment data. A discussion is also included of a new data reduction procedure devised to reduce nonlinear static stability data from small amplitude nonlinear motion histories. GRA

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N80-20242# SRI International Corp., Menlo Park, Calif. Aviation Systems Lab.

AIRBORNE AIDS FOR COPING WITH LOW-LEVEL WIND SHEAR. ALL-WEATHER LANDING SYSTEMS, ENGINEERING SERVICES SUPPORT PROJECT, TASK 2 Final Report, Jun. 1975 - Jul. 1979

W. H. Foy Jul. 1979 103 p refs
(Contract DOT-FA75WA-3650; SRI Proj. 4364)
(AD-A080589; FAA-RD-79-117) Avail: NTIS HC A06/MF A01 CSCL 01/2

The development and testing of airborne displays, instrumentation, and procedures for aiding an airline jet transport pilot to cope with wind shear on approach and landing and on takeoff were studied. The task involved analysis of wind shear effects, development of wind models including shear and turbulence, specification of displays and instrumefit models, and conduct of six large scale piloted flight simulation exercises. A set of candidate standard wind shear models was developed. The beneficial effects of training in a moving base simulator were noted. Tests on the pilot aiding systems were conducted on both wide bodied (DC-10) and nonwide bodied (B-727) aircraft. The aiding systems tested included approach management techniques, go around decision aids, techniques for assisting the pilot during the go around maneuver, and head up displays. The operational and technical role of head up displays during flight operations with wind shear is emphasized. A.W.H.

N80-20243# SRI International Corp., Menlo Park, Calif.

DEVELOPMENT OF WIND SHEAR MODELS AND DETERMINATION OF WIND SHEAR HAZARDS Interim Report, Apr. - Nov. 1977

D. W. Ellis and M. G. Keenan Jan. 1978 96 p refs
(Contract DOT-FA75WA-3650; SRI Proj. 4364)
(AD-A080588; FAA-RD-79-119) Avail: NTIS HC A05/MF A01 CSCL 01/2

Mathematically modeled and measured wind data represented as a function of both aircraft altitude and distance were flown with a fast-time computer model piloted by an idealized controller. The wind models and the runway position relative to each wind field were systematically varied to produce a number of different wind profiles. Relative comparisons of wind profile severity were made, based on aeronautical system performance in the computer. Potentially hazardous wind profiles were identified, and their relative severity designated as low, moderate, or high for purposes of piloted simulator tests. The piloted simulation results were used to verify the severity ratings. Effects of wind shear on aircraft are illustrated using simplified examples and then correlated with wind profile characteristics. Wind profile design techniques and implementation methods are discussed, and a set of candidate standard wind profiles is recommended. The results of the wind shear hazard determination indicate that the severity of a wind shear encounter is dependent on the position and alignment of the approach path with respect to the wind field and on the timing of the encounter, and that both wind shear in the vertical wind component and wind shear in the longitudinal wind component can produce a hazardous condition. High severity wind shear is also found to be hazardous on takeoff. J.M.S.

N80-20244# Atmospheric Science Associates, Bedford, Mass.

AIRFLOW EFFECTS ON RIMING MEASUREMENTS BY A WING TIP-MOUNTED ICE DETECTOR ON THE MC130E RESEARCH AIRPLANE Final Report, 1 Mar. - 31 Aug. 1979

Hillyer G. Norment 24 Aug. 1979 42 p refs
(Contract F19628-79-M-0006; AF Proj. 6670)
(AD-A077019; AFGL-TR-79-0194) Avail: NTIS HC A03/MF A01

Sampling efficiencies for water drops in the diameter range 10 to 7000 microns are calculated theoretically at four proposed mounting sites for an icing indicator instrument on the wing tip of the AFGL MC130E airplane. Significant flux distortion of droplets in the diameter range 10 to 100 microns is indicated at all four sites. Sensitivity to angle-of-attack of the airplane also is found, and a nose-up angle-of-attack of at least 4 deg is recommended. Additional separation of the sensor probe from the wing tip surface of as little as one-half inch is indicated to substantially ameliorate the sampling problems. To obtain the sampling efficiencies, trajectories were calculated with use of a three-dimensional flow code that ignores effects of lift vorticity. Exploratory calculations with a similar code that includes lift indicate that the results obtained with the non-lifting flow are optimistic. GRA

N80-20245# Army Command and General Staff Coll., Fort Leavenworth, Kansas.

F-4 PHANTOM AIRCREW SURVIVAL EQUIPMENT EVALUATION M.S. Thesis Final Report

William Edgar Lindsay 8 Jun. 1979 120 p refs
(AD-A076330) Avail: NTIS HC A06/MF A01 CSCL 06/7

The F-4 Phantom aircraft is equipped with an ejection seat which has space provided in a seat kit for the carriage of aircrew survival equipment. This study evaluated the utilization of this space and the equipment available for inclusion in this kit. The space is not being filled with appropriate equipment in many instances because the required density of the packed kit is too great, requiring local units to pack lead shot instead of survival equipment. The survival equipment available to the aircrew in the seat kit is generally of good quality and sound theoretical design. However, there are many areas in which the equipment has not been redesigned to use current technology and thus provide more and better equipment in a smaller space. Additionally, the average survival kit lacks the cold weather survival protective equipment required to sustain the downed aircrew member. This study contains specific recommendations for equipment redesign and selection for the F-4 survival seat pack. GRA

N80-20246# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.

DEVELOPMENT OF A BIRD/AIRCRAFT STRIKE HAZARD ASSESSMENT METHODOLOGY M.S. Thesis

Jeffrey M. Jorgensen and Kent G. Smith Sep. 1979 80 p refs
(AD-A075584; AFIT-LSSR-10-79B) Avail: NTIS HC A05/MF A01 CSCL 13/12

This thesis effort was an attempt to identify a managerial tool that could be used to make decisions when comparing alternative methods of reducing bird/aircraft strike hazards. The general theory was that there should be certain identifiable factors present on a base that affect the probability of a bird/aircraft strike. A relationship was developed by using information from several bases which related to their environment and aircraft operating procedures. Using multiple linear regression, a model was developed to explain how the base's strike rate is affected by these factors. The effort resulted in several conclusions and recommendations that could be used in further research efforts in this area of utmost importance to the Air Force. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N80-20247# National Weather Service, Silver Spring, Md. Techniques Development Lab.

NOWCAST AND SHORT-RANGE (0-2 HOUR) FORECASTS OF THUNDERSTORMS AND SEVERE CONVECTIVE WEATHER FOR USE IN AIR TRAFFIC CONTROL Final Report, Apr. 1978 - Nov. 1979

Mikhail A. Alaka, Robert C. Elvander, and Robert E. Saffle Nov. 1979 41 p refs

(Contract DOT-FA78WAI-886; FAA Proj. 152-461-01)

(AD-A080426; FAA-RD-79-98) Avail: NTIS HC A03/MF A01 CSCL 17/7

The development of improved automated techniques for monitoring and forecasting thunderstorms and severe local convective weather at and around air terminals is discussed. The products being developed are intended primarily for air traffic controllers. Weather radars with automatic signal digitizing capability are evaluated. The radar data processor (RADAP) which includes a minicomputer, color graphic and alphanumeric display devices, and communication ports is highlighted in the evaluation. The project D/RADEX (digitized radar experiment) is described. The D/RADEX network offers an interim means to develop and evaluate radar data processing techniques that are aimed for RADAP implementation. A.W.H.

N80-20248# SRI International Corp., Menlo Park, Calif.

INERTIALLY AUGMENTED APPROACH COUPLERS Final Report, Jun. 1975 - Jun. 1979

D. A. Tiedeman, F. B. Benson, L. V. Miller, R. J. Rudig, T. J. Schuldt, C. P. Shih, and E. D. Skelley Jun. 1979 131 p refs

(Contract DOT-FA75WA-3650; SRI Proj. 4364)

(AD-A080488; FAA-RD-79-118) Avail: NTIS HC A07/MF A01 CSCL 01/2

The results of a series of engineering design studies and tests of methods for acceleration augmentation of airplane control systems for approach and landing are presented. Emphasis is on the use of body-mounted accelerometers, which are reasonably inexpensive. Control laws were developed for several aircraft (CV-880, DC-10, B-727) and tested by simulation with both automatic and human pilots and include automatic landing systems, flight director with full ILS, and flight director for nonprecision approach. The modified flight director (MFD) control algorithms (pitch, roll, and thrust) were also tested in large-scale piloted flight simulations. Approach and landing performance on Category 1 and 2 ILS beams comparable to that with current systems on Category 3 beams was achieved along with improved performance over current systems in coping with low level wind shear. Performance comparable to that attainable with an expensive full inertial navigation system was demonstrated. J.M.S.

N80-20249*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.

IMPROVED SUN-SENSING GUIDANCE SYSTEM FOR HIGH-ALTITUDE AIRCRAFT Patent Application

Robert D. Reed, inventor (to NASA) Filed 12 Mar. 1980 17 p

(NASA-Case-FRC-11052-1; US-Patent-Appl-SN-129783) Avail: NTIS HC A02/MF A01 CSCL 17G

A Sun sensing guidance system for high altitude aircraft is described. The system is characterized by a disk shaped body mounted for rotation aboard the aircraft in exposed relation to solar radiation and has a plurality of mutually isolated chambers. The photosensors are arranged in facing relation with the chamber openings for receiving incident solar radiation and responsively providing a voltage output. The photosensors are connected in a paired relation through a bridge circuit for providing heading error signals in response to detected imbalances in intensities of solar radiation incident on the photosensors of either pair of photosensors until a nulled relationship is achieved for the disk to the source of radiation. NASA

N80-20250*# Ohio Univ., Athens. Avionics Engineering Center.

ANALYSIS OF FIRST AND SECOND ORDER BINARY QUANTIZED DIGITAL PHASE-LOCKED LOOPS FOR IDEAL AND WHITE GAUSSIAN NOISE INPUTS

Paul R. Blasche 31 Mar. 1980 127 p

(Grant NGR-36-009-017)

(NASA-CR-162841; TM-75) Avail: NTIS HC A07/MF A01 CSCL 17G

Specific configurations of first and second order all digital phase-locked loops are analyzed for both ideal and additive white Gaussian noise inputs. In addition, a design for a hardware digital phase-locked loop capable of either first or second order operation is presented along with appropriate experimental data obtained from testing of the hardware loop. All parameters chosen for the analysis and the design of the digital phase-locked loop are consistent with an application to an Omega navigation receiver although neither the analysis nor the design are limited to this application. Author

N80-20251*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

SIMULATION OF A NAVIGATOR ALGORITHM FOR A LOW-COST GPS RECEIVER

Ward F. Hodge Feb. 1980 23 p refs

(NASA-TM-81778) Avail: NTIS HC A02/MF A01 CSCL 17G

The analytical structure of an existing navigator algorithm for a low cost global positioning system receiver is described in detail to facilitate its implementation on in-house digital computers and real-time simulators. The material presented includes a simulation of GPS pseudorange measurements, based on a two-body representation of the NAVSTAR spacecraft orbits, and a four component model of the receiver bias errors. A simpler test for loss of pseudorange measurements due to spacecraft shielding is also noted. Author

N80-20252# Electronics Engineering Group (1842nd), Scott AFB, Ill. TRACALS/Electronics Systems Branch.

COMPUTER MODELING OF TERRAIN EFFECTS ON INSTRUMENT LANDING SYSTEM (ILS) GLIDE SLOPE SYSTEMS

James A. Baggett 15 Nov. 1979 30 p refs

(AD-A078228; Rept-1842-EEG/EEITN-TR-80-2) Avail: NTIS HC A03/MF A01 CSCL 17/7

This report describes the two major components of an instrument landing system (ILS); the localizer, which provides horizontal guidance, and the glide slope, which provides vertical guidance. GRA

N80-20253# Army Communications-Electronics Engineering Installation Agency, Fort Huachuca, Ariz.

STANDARD ENGINEERING INSTALLATION PACKAGE, NONDIRECTIONAL BEACON Final Report

15 Nov. 1979 119 p

(AD-A078204; USACEEIA-SEIP-013) Avail: NTIS HC A06/MF A01 CSCL 17/7

This Standard Engineering Installation Package (SEIP) provides information for the engineering and installation of NDB facilities worldwide. Information provided consists of site survey data, siting criteria, installation specifications and instructions, a bill of materials, quality assurance procedures and completion certification format. Information provided must be adapted to the specific NDB facility/location by the project engineer. GRA

N80-20254# Army Communications-Electronics Combat Developments Agency, Fort Huachuca, Ariz.

STANDARD ENGINEERING INSTALLATION PACKAGE AN/TSQ-117, AIRCRAFT CONTROL CENTRAL Final Report

31 Oct. 1979 73 p

(AD-A079776; USACEEIA-SEIP-027) Avail: NTIS HC A04/MF A01 CSCL 17/7

This standard engineering installation package assists project

officers, logisticians, engineers, and technicians to program, procure, engineer, and install the AN/TSQ-117. The document provides a system description with prerequisites that are essential for effective implementation of the AN/TSQ-117. The document also provides the necessary drawings, bill of materials, and quality assurance. GRA

N80-20255# Systems Research Labs., Inc., Dayton, Ohio.
AIRBORNE ELECTRONIC TERRAIN MAP SYSTEM: A LITERATURE REVIEW
Gilbert G. Kuperman (AMRL) and Anthony J. DeFrances Wright-Patterson AFB, Ohio AMRL Oct. 1979 59 p refs
(Contract F33615-79-C-0503; AF Proj. 7184; AF Proj. 2003)
(AD-A079402; AMRL-TR-79-92) Avail: NTIS HC A04/MF A01 CSCL 17/7

Currently, the United States Air Force is placing significant emphasis on low-altitude high-speed profiles for tactical aircraft survivability. In order to execute these terrain avoidance profiles, pilots require an efficient and credible source of terrain relief information for both accurate and safe navigation and to alleviate the high workload associated with the primary pilotage function. This report highlights many of the limitations of current airborne sources of cartographic information and describes a viable alternative--the Airborne Electronic Terrain Map System (AETMS). The AETMS consists of an in-the-cockpit, computer-generated, wide-area terrain map display, capable of providing forward-looking perspective and/or planimetric information. Because of the large integrated data base, real-time information source for many mission segments is provided. The system is totally self-contained and passive, which precludes the possibility of jamming and reduces detection probability. GRA

N80-20256# Aerospace Corp., El Segundo, Calif.
COMBINED PSEUDO RANGE AND DOPPLER POSITIONING FOR THE STATIONARY NAVSTAR USER Final Report
Paul S. Jorgensen Mar. 1979 46 p
(Contract F04701-78-C-0079)
(AD-A079543; TR-0079-4475-01-03; SAMSO-TR-79-79) Avail: NTIS HC A03/MF A01 CSCL 17/7

An early success in testing NAVSTAR user equipment was achieved with the Manpack receiver. Using only two satellites, NAVSTARS 1 and 2, the receiver accurately performed two-dimensional positioning while stationary. It was, in effect, combining pseudo range and integrated Doppler data. This concept of combining both types of data can be extended to three dimensions and to the operational phase 3 NAVSTAR. The stationary user can accomplish three-dimensional navigation with only three satellites. This capability is of interest to the Army since it would permit the stationary use of NAVSTAR with much greater elevation mask angles. With the baseline 24-satellite constellation, three-dimensional navigation can be accomplished with a 30-deg mask angle, but it will take a few minutes longer because of the extra time required for making integrated Doppler measurements. Using this technique, three-dimensional position will be obtained to within 16 meters about 90 percent of the time. This operational capability will enhance the Army's ability to use NAVSTAR in the presence of jamming, foliage, and terrain. GRA

N80-20257# Intradyne of Virginia, Inc., Vienna.
NAVSTAR GPS CIVIL APPLICATIONS STUDY Final Report
J. C. Hansen, M. X. Polk, and A. M. Webster, Jr. Jul. 1979 161 p
(Contract F04701-78-C-0188)
(AD-A078277; SAMSO-TR-79-63) Avail: NTIS HC A08/MF A01 CSCL 17/7

This report examines the impact on the civil navigation community and on military operations of introducing the NAVSTAR GPS for civil applications. Institutional, operational, technical and cost factors are considered and assessed. A low cost GPS user set for civil applications is employed to develop comparative costs for current vice GPS oriented civil navigation environments. GRA

N80-20258# Pennsylvania Univ., Philadelphia. Dept. of Civil and Urban Engineering.
OPTIMAL FLOW CONTROL OF AIR TRAFFIC Final Report
William J. Dunlay, Jr. and W. Bruce Allen Aug. 1979 155 p refs
(Contract DOT-OS-70065)
(PB80-105976; DOT-DPA-RSPA-50-79/15) Avail: NTIS HC A08/MF A01 CSCL 17G

Flow control procedures for air traffic initiated during periods of unusually high demand or low capacity are discussed. Aspects of flow control which are addressed include forecasting of demand and capacity, forecasting of congestion, and assignment of delays and landing and departure priorities. In particular, the demand capacity-buffer relationship is explored, with emphasis on improvement of forecasts and evaluation of their accuracy. It is shown that buffer size, which represents the excess number of aircraft in the airspace due to delays, can be estimated recursively and then forecasted on the basis of arrival forecasts and the number of landings recorded. Regression analysis is used to describe and predict flow rates of arrivals and departures. GRA

N80-20259# National Technical Information Service, Springfield, Va.
INERTIAL NAVIGATION AND GUIDANCE, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Jun. 1978 - Jun. 1979
William E. Reed Jul. 1979 206 p Supersedes NTIS/PS-78/0735; NTIS/PS-77/0609; NTIS/PS-76/0552; NTIS/PS-75/436
(NTIS/PS-79/0762/9; NTIS/PS-78/0735; NTIS/PS-77/0609; NTIS/PS-76/0552; NTIS/PS-75/436) Avail: NTIS HC $28.00/MF $28.00 CSCL 17G

The design, development, performance, equipment, and applications of inertial navigation and guidance systems are reported. Reports on strapdown systems are included. This updated bibliography contains 197 abstracts, 36 which are entries to the previous edition. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

N80-20260*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE ROLE OF TECHNOLOGY AS AIR TRANSPORTATION FACES THE FUEL SITUATION
Cornelius Driver Mar. 1980 15 p Presented at Upper Midwest Council, Minneapolis, 1 Nov. 1979
(NASA-TM-81793) Avail: NTIS HC A02/MF A01 CSCL 01C

Perspectives on the air transportation fuel situation are discussed including intercity air traffic, airline fuel consumption, fuel price effects on ticket price, and projected traffic and fuel useage between now and the year 2000. Actions taken by the airlines to reduce consumption are reviewed, as well as efforts currently underway to improve fuel consumption. Longer range technology payoffs resulting from NASA research programs are reviewed and results from studies on the use of alternate fuels are discussed. A.W.H.

N80-20261*# Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.
A SINGULAR PERTURBATION ANALYSIS OF MINIMUM TIME LONG RANGE INTERCEPT Final Report
Anthony J. Calise Jan. 1980 50 p refs
(Grant NsG-1498)
(NASA-CR-162895) Avail: NTIS HC A03/MF A01 CSCL 01C

The application of singular perturbation theory for deriving algorithms suitable for on board real time computation of optimal aircraft trajectory control was investigated. Minimum time intercept in three dimensions was selected as a pilot problem formulation, and data for an early version F-4 aircraft was used to represent aircraft aerodynamic and propulsion characteristics. Results include

the derivation of nonlinear, near optimal feedback control laws that are readily implementable in an aircraft flight computer, performance results for a variety of initial conditions (including optimal intercept at short ranges), and a point mass three dimensional simulation suitable for representing fighter aircraft under closed loop optimal control. J.M.S.

N80-20262# Bell Helicopter Co., Fort Worth, Tex.
ROTOCRAFT FLIGHT SIMULATION, COMPUTER PROGRAM C81. VOLUME 3: PROGRAMMER'S MANUAL Final Report, Nov. 1976 - Aug. 1977
P. Y. Hsieh Oct. 1979 91 p
(Contract DAAJ02-77-C-0003; DA Proj. 1L2-62209-AH-76)
(AD-A077345; BHT-699-099-062-Vol-3; USARTL-TR-77-54C) Avail: NTIS HC A05/MF A01 CSCL 01/3

This report consists of three volumes and documents the current version in the C81 family of rotorcraft flight simulation programs developed by Bell Helicopter Textron. This current version of the digital computer program is referred to as AGAJ77. The accompanying program for calculating fully coupled rotor blade mode shapes is called DNAM05, and the rotor wake program is called ARS102. The first volume, the Engineer's Manual, presents an overview of the computer program capabilities plus discussions for the background and development of the principal mathematical models in the program. The models discussed include all those currently in the program. Volume 2, the User's Manual, contains the detailed information necessary for setting up an input data deck and interpreting the computed data. Volume 3, the Programmer's Manual, includes a catalog of subroutines and a discussion of programming considerations. The source tapes and related software for the computer programs documented in this report are unpublished data on file at the Applied Technology Laboratory, U.S. Army Research and Technology Laboratories (AVRADCOM), Fort Eustis, Virginia. GRA

N80-20263# Northrop Corp., Hawthorne, Calif. Aircraft Group.
ADVANCED FIREFLY ASSESSMENT GENERALIZED MECHANIZATION REQUIREMENTS REPORT Interim Report, 25 Oct. 1978 - Feb. 1979
S. J. Asseo Wright-Patterson AFB, Ohio AFAL Jun. 1979 112 p refs
(Contract F33615-78-C-1503; AF Proj. 7629)
(AD-A079752; AFAL-TR-79-1092) Avail: NTIS HC A06/MF A01 CSCL 19/5

The requirements for the design of the Generalized Mechanization of the FIREFLY concept of Integrated Fire and Flight Control to be implemented in a digital simulation has been completed. This generalized mechanization consists of a set of equations, algorithms, and control laws capable of being programmed into an airborne digital computer which can be specialized to perform successfully in a variety of tactical aircraft with differing avionics sensors, fire control algorithms, control laws, flight control systems, and weapon delivery modes. The document first addresses the scope of the requirements analysis followed by a description of the analysis done in deriving the requirements of the generalized mechanization. Finally, the requirements are summarized in a section discussing them explicitly in relation to their place in the overall fire control system. A discussion of the work done on the FIREFLY 2 familiarization and initial analysis of two of the potential advanced concepts for evaluation is contained in the appendices. GRA

N80-20264# Air Force Packaging Evaluation Agency, Wright-Patterson AFB, Ohio.
EVALUATION OF PACKAGING FOR THE CN-1325/ASN-108 AHRS DISPLACEMENT GYRO, F-15 AIRCRAFT Final Report
Frank C. Jarvis Sep. 1979 17 p
(AD-A078707; PTPT-79-15) Avail: NTIS HC A02/MF A01 CSCL 13/4

The packaging evaluation of the CN-1325/ASN-108 AHRS Displacement Gyro (F-15) revealed that the pack is not adequate to provide the 15 G shock protection level required for this item. The field tests confirmed the laboratory results which produced a maximum impact force of 21 Gs. A prototype pack with corner pad cushion inserts was evaluated and found to be suitable as an interim or a permanent replacement for packaging this item. GRA

N80-20265# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
PRELIMINARY AIRWORTHINESS EVALUATION, AH-1G WITH THE AIRBORNE TARGET ACQUISITION FIRE CONTROL SYSTEM AND THE HELLFIRE MODULAR MISSILE SYSTEM INSTALLED Final Report, Jun. 1978 - Jan. 1979
Patrick J. Moe and Raymond B. Smith Jul. 1979 43 p refs
(AD-A078340; USAAEFA-78-02) Avail: NTIS HC A03/MF A01 CSCL 19/5

The AH-1G helicopter with the HELLFIRE modular Missile System (HMMS) and the Airborne Target Acquisition Fire Control System (ATAFCS) is being used as a surrogate trainer for the YAH-64 helicopter. The United States Army Aviation Engineering Flight Activity was tasked to provide quantitative and qualitative data on the handling qualities of the helicopter, obtain limited level flight performance data, and obtain limited handling qualities of the helicopter with only the ATAFCS installed. The test helicopter was a production AH-1G helicopter (212 tail rotor) modified with an ATAFCS mockup and carrying eight HELLFIRE missiles. Six productive flight test hours were flown in six flights. No shortcomings or deficiencies attributable to HMMS and ATAFCS installation were found. The AH-1G helicopter, with HMMS and ATAFCS installed, exhibits an additional equivalent flat plate area of 4.0 sq ft compared to the standard AH-1Q helicopter. The handling qualities of the helicopter with only the ATAFCS installed are essentially the same as the production AH-1G helicopter. GRA

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N80-20266# Hughes Aircraft Co., Los Angeles, Calif. Display Systems Lab.
DEVELOPMENT OF A COLOR ALPHANUMERIC LIQUID CRYSTAL DISPLAY Final Report, 1 Oct. 1977 - 20 May 1979
J. E. Gunther Warminster, Pa. NADC Dec. 1979 39 p refs
(Contract N62269-77-C-0477)
(AD-A079289; HAC-E0122; HAC-P80440; NADC-77212-30) Avail: NTIS HC A03/MF A01 CSCL 01/3

This report encompasses efforts directed toward the development of a multicolor liquid crystal display suitable for aircraft command and control applications. The approach taken was to combine a striped, color-selective filter with previously developed matrix liquid crystal display technology. Two 1.75 x 1.75 inch displays and one set of LSI drive circuits were constructed. The displays provided 100 elements per inch horizontal resolution and 33 elements per inch vertical resolution, with each vertical element consisting of a red-green-blue triad. While the optical performance of the displays was limited, sufficient information was gained to ensure adequate viewability in subsequent designs. GRA

N80-20267# Arinc Research Corp., Annapolis, Md.
MECHANIZATION ARCHITECTURE FOR ENHANCEMENT OF AVIONICS PLANNING DATA BASE Final Report
S. Cotton and R. Gilbertson Sep. 1979 170 p
(Contract F33657-79-C-0567)
(AD-A075572; Rept-1750-01-1-2024) Avail: NTIS HC A08/MF A01 CSCL 05/2

This report presents the design of an enhancement to the mechanized version of the Avionics Planning Baseline (APB). For each Air Force aircraft, the APB records the force structure (for a 15-year period), the avionics suite, all present and planned modifications to the avionics suite, all class 4 and class 5 of those modifications, and all ROC/SON/GOR statements dealing with avionics requirements. GRA

N80-20268# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A STUDY OF TWO AVIONICS LIFE CYCLE COST MODELS AND THEIR APPLICABILITY IN THE COMMUNICATIONS-ELECTRONICS-METEOROLOGICAL ENVIRONMENT M.S. Thesis
Nicholas J. Drobot and Martin H. Johnson Sep. 1979 159 p refs
(AD-A076881; AFIT/GSM/SM/79S-S) Avail: NTIS HC A08/MF A01 CSCL 14/1

This study determines the applicability of Life Cycle Cost (LCC)/Logistic Support Cost (LSC) models in the CEM environment. The scope of this study addresses two of the models identified (LSC, PRICE) with respect to three Air Force TACAN systems. A methodology is developed to evaluate each model based on the five desirable model characteristics: availability of input data, validity, sensitivity, completeness, and documentation. The results presented are also framed within the above model characteristics. The most important model characteristic, validity, is accessed by comparison with an AFCS cost study of NAVAIDs equipment. Based on the methodology, the results indicate that both models are applicable in the present and future CEM environment. GRA

N80-20269# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
AN OPERATING AND SUPPORT COST MODEL FOR AVIONICS AUTOMATIC TEST EQUIPMENT M.S. Thesis
Joel A. Guerra, Andrew J. Lesko, and Jose G. Pereira Sep. 1979 181 p refs
(AD-A075586; AFIT-LSSR-21-79B) Avail: NTIS HC A09/MF A01 CSCL 14/1

One of the fastest growing elements of weapon system support equipment which relates directly to Operating and Support (O and S) costs is Automatic Test Equipment (ATE). The importance of ATE has expanded to such a degree that it requires additional management attention. The importance is exemplified by the $600 million projected development and acquisition costs of ATE for the F-16. This amount of cost qualifies the F-16 ATE for major program status. This thesis documents the development of a model to estimate and measure O and S costs for Avionics ATE. The model will be an important addition to the tools used in ATE Life Cycle Costing (LCC) techniques. It is envisioned primarily as an evaluation tool to be used in ATE source selection, but may also be useful in various design trade-off studies. GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N80-20270# National Aviation Facilities Experimental Center, Atlantic City, N. J.
EXHAUST EMISSIONS CHARACTERISTICS FOR A GENERAL AVIATION LIGHT-AIRCRAFT TELEDYNE CONTINENTAL MOTORS (TCM) GTSIO-520-K PISTON ENGINE Final Report
Eric E. Becker Dec. 1979 94 p refs
(FAA Proj. 201-521-100)
(AD-A080433; FAA-NA-79-40) HC A05/MF A01 CSCL 21/7

General aviation piston engine exhaust emission tests were conducted to determine and establish total exhaust emission characteristics for a GTSIO-520-K engine. The engine is described along with the fuel flow system and the air cooling system. The test set up, procedures, and facilities are described and the computation procedures are presented. The results are summarized for the exhaust emissions, the maximum cylinder head temperatures, and the critical landing and takeoff cycle. A.W.H.

N80-20271*# Teledyne Continental Motors, Muskegon, Mich.
A 150 AND 300 kW LIGHTWEIGHT DIESEL AIRCRAFT ENGINE DESIGN STUDY Final Report
Alex P. Brouwers Apr. 1980 149 p refs
(Contract NAS3-20830)
(NASA-CR-3260; Rept-756) Avail: NTIS HC A07/MF A01 CSCL 21A

The diesel engine was reinvestigated as an aircraft powerplant through design study conducted to arrive at engine configurations and applicable advanced technologies. Two engines are discussed, a 300 kW six-cylinder engine for twin engine general aviation aircraft and a 150 kW four-cylinder engine for single engine aircraft. Descriptions of each engine include concept drawings, a performance analysis, stress and weight data, and a cost study. This information was used to develop two airplane concepts, a six-place twin and a four-place single engine aircraft. The aircraft study consists of installation drawings, computer generated performance data, aircraft operating costs, and drawings of the resulting airplanes. The performance data show a vast improvement over current gasoline-powered aircraft. R.E.S.

N80-20272*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF WATER INJECTION AND OFF SCHEDULING OF VARIABLE INLET GUIDE VANES, GAS GENERATOR SPEED AND POWER TURBINE NOZZLE ANGLE ON THE PERFORMANCE OF AN AUTOMOTIVE GAS TURBINE ENGINE
Edward L. Warren Mar. 1980 35 p
(Contract EC-77-A-31-1040)
(NASA-TM-81415; E-333; DOE/NASA/1040-80/10) Avail: NTIS HC A03/MF A01 CSCL 21E

The Chrysler/ERDA baseline automotive gas turbine engine was used to experimentally determine the power augmentation and emissions reductions achieved by the effect of variable compressor and power engine geometry, water injection downstream of the compressor, and increases in gas generator speed. Results were dependent on the mode of variable geometry utilization. Over 20 percent increase in power was accompanied by over 5 percent reduction in SFC. A fuel economy improvement of at least 6 percent was estimated for a vehicle with a 75 kW (100 hp) engine which could be augmented to 89 kW (120 hp) relative to an 89 Kw (120 hp) unaugmented engine. Author

N80-20273*# Notre Dame Univ., Ind. Dept. of Electrical Engineering.
ALTERNATIVES FOR JET ENGINE CONTROL Semiannual Status Report, 1 Sep. 1979 - 29 Feb. 1980
Michael K. Sain 1980 93 p refs
(Grant NsG-3048)
(NASA-CR-162911) Avail: NTIS HC A05/MF A01 CSCL 21E

Nonlinear modeling researches involving the use of tensor analysis are presented. Progress was achieved by extending the studies to a controlled equation and by considering more complex situations. Included in the report are calculations illustrating the modeling methodology for cases in which variables take values in real spaces of dimension up to three, and in which the degree of tensor term retention is as high as three. R.E.S.

N80-20274*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
JT9D-7A (SP) JET ENGINE PERFORMANCE DETERIORATION TRENDS
G. Paul Richter, W. J. Olsson, and N. B. Andersen 1980 24 p ref Presented at the Intern. Aircraft Maintenance Eng. Exhibition and Conf., Dallas, 8-10 Apr. 1980; sponsored by Hamilton Burr Publishing Co. - Prepared in cooperation with Pratt and Whitney Aircraft Group, East Hartford, Conn. and Pan American World Airways, Inc., Jamaica, N.Y.
(NASA-TM-81459; E-388) Avail: NTIS HC A02/MF A01 CSCL 21E

The levels, trends, and causes of engine performance deterioration were investigated. A series of installed engine calibrations (both on-the-ground and in-flight) were performed on two new Pan American World Airways 747 SP aircraft. The performance data gathered covered from before the first flight through approximately 1000 flight cycles and 6900 flight hours.

To accomplish the calibrations a special instrumentation system for ground testing of installed engines over a broad power range was used along with performing concurrent in-flight engine calibrations under revenue service conditions. Results of the analysis of the data, which provide a better understanding of short and long term performance deterioration of both engines and modules are presented. J.M.S.

N80-20275*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OPTIMUM SUBSONIC, HIGH-ANGLE-OF-ATTACK NACELLES
Roger W. Luidens, Norbert O. Stockman, and James H. Diedrich [1979] 20 p refs Prepared for the 12th Congr. of the Intern. Council of the Aeron. Sci., Munich, 13-17 Oct. 1980 and the 1980 Aerospace Congr. and Exposition, Los Angeles, 13-16 Oct. 1980; sponsored by the Soc. of Automotive Engr.
(NASA-TM-81491; E-406) Avail: NTIS HC A02/MF A01 CSCL 21E

The optimum design of nacelles that operate over a wide range of aerodynamic conditions and their inlets is described. For low speed operation the optimum internal surface velocity distributions and skin friction distributions are described for three categories of inlets: those with BLC, and those with blow in door slots and retractable slats. At cruise speed the effect of factors that reduce the nacelle external surface area and the local skin friction is illustrated. These factors are cruise Mach number, inlet throat size, fan-face Mach number, and nacelle contour. The interrelation of these cruise speed factors with the design requirements for good low speed performance is discussed. J.M.S.

N80-20276# Naval Ship Research and Development Center, Bethesda, Md.
FEASIBILITY STUDY OF AN ISOLATED REVERSE-TURBINE SYSTEM FOR GAS TURBINE ENGINES
Thomas L. Bowen Dec. 1979 133 p refs
(SF43432301)
(AD-A077898; DTNSRDC-79/033) Avail: NTIS HC A07/MF A01 CSCL 21/5

Aircraft gas turbine engines, as now configured for ship propulsion, are unidirectional in output rotation and, therefore, require the added complexity of a reversing transmission or a reversible-pitch propeller. This study explores the feasibility of a novel reverse-turbine concept which is configured to adapt to existing free-power turbine engines without additional clutches or separate drive trains. This device, termed the 'isolated reverse turbine', is sized for meeting that most demanding maneuver for a fixed-pitch propeller-driven frigate or destroyer, namely, the crash reversal maneuver. The reverse-turbine concept would replace the function of the reversing gear or the reversible-pitch propeller; it could also complement electrically actuated reverse transmissions by eliminating the need for braking resistors and switches. Because of the potentially wide applicability of this reverse-turbine concept, it is recommended that additionally substantiating data be obtained to demonstrate the practicality of required hardware components. Full-scale development is not recommended at this time because the status of the above-mentioned alternatives has not been fully evaluated. GRA

N80-20277# Iowa State Univ. of Science and Technology, Ames. Engineering Research Inst.
AERODYNAMICS OF ADVANCED AXIAL-FLOW TURBOMACHINERY Annual Report, 1 Oct. 1978 - 30 Sep. 1979
G. K. Serovy, Patrick Kavanaugh, Theodore H. Okiishi, and Elmer C. Hansen Nov. 1979 52 p refs
(Contract F49620-79-C-0002; AF Proj. 2307)
(AD-A079617; ISU-ERI-AMES-80060; TCRL-14; AFOSR-79-1325TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

A multi-task research program on aerodynamic problems in advanced axial-flow turbomachine configurations is being carried on at Iowa State University. The elements of this program are intended to contribute directly to the improvement of compressor, fan, and turbine design methods. Experimental efforts in intrapassage flow pattern measurement, unsteady blade row interaction, and control of secondary flow are included, along with computational work on inviscid-viscous interaction blade passage flow techniques. This first Annual Report summarizes progress to date and indicates the direction of each task for the immediate future. GRA

N80-20278# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
VELOCITY PROFILES IN A LONG INLET DUCT EMPLOYING A PHOTON CORRELATING LASER VELOCIMETER WITHOUT SEEDING M.S. Thesis
H. J. V. Rogers Dec. 1979 172 p refs
(AD-A079878; AFIT/GAE/AA/79D-16) Avail: NTIS HC A08/MF A01 CSCL 14/3

This thesis involves a practical application of the Malvern Laser Velocimeter System (LV). In this work, the LV was used to measure mean velocity profiles across the inside diameter of a duct which supplies air to the compressor of a jet engine. The engine, which is a General Electric J-85 turbo-jet engine is located in the Propulsion Laboratories of Wright-Patterson Air Force Base in Ohio. In addition to the mean velocity profiles, the LV was used to measure turbulence intensity profiles across the inside diameter of the duct at each of the three test points. To analyze the quality of the LV data as obtained, alternate mean velocity profiles and turbulence intensity profiles were obtained with the aid of a Hot Wire Anemometer System and a Pitot-Static Tube. During each of the traverses, or tests, with the LV System, the Hot Wire System and the Pitot-Static Tube, the engine was held at a fixed RPM, being 50% or 70% of maximum engine RPM. Good correlation was achieved between each of the three systems in respect to the mean velocity profiles obtained at each of the three test positions while the turbulence intensity profiles matched well in the regions of the flow where turbulence levels of 2% to 30% were encountered. GRA

N80-20279# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN EXPERIMENTAL STUDY OF STATIC THRUST AUGMENTATION USING A 2-D VARIABLE EJECTOR M.S. Thesis
Eli Kedem Dec. 1979 97 p refs
(AD-A079857; AFIT/GAE/AA/79D-7) Avail: NTIS HC A05/MF A01 CSCL 21/8

A short rectangular throat ejector was constructed and tested to determine the effects of a number of variables on thrust augmentation and mass augmentation. The variables included those associated with geometry (e.g., diffuser length/throat length, diffuser area ratio, diffuser sidewall angle, nozzle angles and positions) and those due to differences in primary mass flow rate distributions among the nozzles. There were two kinds of thrust augmentation that were calculated; the free thrust augmenting ratio and the isentropic thrust augmenting ratio. The free thrust augmenting ratio is the ratio of the ejector's measured thrust to the sum of the nozzles' measured thrust, if each of them were discharged separately to ambient pressure. The isentropic thrust augmenting ratio is the ratio of the ejector's measured thrust to the calculated thrust of the nozzles if discharged isentropically to the ambient pressure. A free thrust augmentating ratio as high as 1.63 and an isentropic thrust augmenting ratio of up to 1.29 were obtained. Mass augmentation which is the ratio of secondary flow to primary flow was in the range of 3.5 to 5. Some conclusions concerning design aspects were drawn also. They include the necessity of 3-D shrouding for the ejector's inlet and exit and the prevention of blowing high velocity air (primary and BLC flow) tangential to the ejector walls. GRA

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N80-20280*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
WING/STORE FLUTTER WITH NONLINEAR PYLON STIFFNESS

Robert N. Desmarais and Wilmer H. Reed, III Apr. 1980 8 p refs Presented at the AIAA/ASME/ASCE/AHS 21st Structures, Struct. Dyn. and Mater. Conf., Seattle, 12-14 May 1980
(NASA-TM-81789) Avail: NTIS HC A02/MF A01 CSCL 01C

Recent wind tunnel tests and analytical studies show that a store mounted on a pylon with soft pitch stiffness provides substantial increase in flutter speed of fighter aircraft and reduces dependency of flutter on mass and inertia of the store. This concept, termed the decoupler pylon, utilizes a low frequency control system to maintain pitch alignment of the store during maneuvers and changing flight conditions. Under rapidly changing transient loads, however, the alignment control system may allow the store to momentarily bottom against a relatively stiff backup structure in which case the pylon stiffness acts as a hardening nonlinear spring. Such structural nonlinearities are known to affect not only the flutter speed but also the basic behavior of the instability. The influence of pylon stiffness nonlinearities on the flutter characteristics of wing mounted external stores is examined. J.M.S.

N80-20281# Perceptronics, Inc., Woodland Hills, Calif.
ADAPTIVE ESTIMATION OF INFORMATION VALUES IN CONTINUOUS DECISION MAKING AND CONTROL OF ADVANCED AIRCRAFT Final Report
Randall Steeb, Yee-Yeen Chu, Cynthia Clark, Yo Ram Alperovitch, and Amos Freedy Jun. 1979 127 p refs
(Contract F44620-76-C-0094; AF Proj. 2313)
(AD-A077917; PATR-1037-79-6; AFOSR-79-1266TR) Avail: NTIS HC A07/MF A01 CSCL 05/10

This report describes research and development centered on evaluation of information needs in advanced operations. The selection of information for display is a recurrent, subjective decision involving many factors--aircraft state, environmental conditions, operator capabilities, and acquisition costs, among others. An adaptive computer model has been developed which incorporates these factors into a multi-attribute decision model. The program is designed to capture the operator's information seeking policy using a training algorithm based on pattern recognition techniques. The individual policy is then used for information system evaluation and for automated information management. Experimental tests of the adaptive modeling and information management approaches were made using a task simulation resembling multiple intercept operations in advanced aircraft. Individual subjects (8 in study) navigated a simulated aircraft through a hazardous, changing environment. The report includes an example application of the information management program to F-14 threat intercept operations and a set of system application guidelines. GRA

N80-20282# Dayton Univ. Research Inst., Ohio.
DEVELOPMENT OF STABILITY METHODS FOR APPLICATIONS TO NONLINEAR AEROELASTIC OPTIMIZATION Final Report, Jan. 1978 - Jun. 1979
R. F. Taylor Jul. 1979 189 p refs
(Grant AF-AFOSR-3487-78; AF Proj. 2307)
(AD-A077851; UDR-TR-79-64; AFFDL-TR-79-3114) Avail: NTIS HC A09/MF A01 CSCL 20/4

An approximate procedure is developed which determines efficiently and accurately the amplitude-dependent stability of nonlinear systems. This new procedure, which is referred to as the 'method of imposed disturbances', is shown to be especially applicable to studies of the sensitivity of nonlinear aeroelastic systems to changes in design variables. Emphasis is placed on airfoil and panel flutter instabilities in aerodynamically nonlinear flow. To develop the theory, modified forms of the van der Pol oscillator equation and of the Lewis servomechanism equation are studied. Based on the principle of conservation of energy in a limit cycle, approximate closed-form expressions are developed which relate the loading and the limit amplitude to system design variables. Results are compared to solutions obtained by numerical integration. GRA

N80-20283# ARO, Inc., Arnold Air Force Station, Tenn.
AIRCRAFT MOTION SENSITIVITY TO DYNAMIC STABILITY DERIVATIVES Final Report, 1 Oct. 1977 - 30 Sep. 1978
T. F. Langham AEDC Jan. 1980 142 p refs
(AF Proj. 921E)
(AD-A079421; AEDC-TR-79-11) Avail: NTIS HC A07/MF A01 CSCL 20/4

A six degree-of-freedom, nonlinear dynamic derivative sensitivity study has been conducted on a fighter/bomber and an attack-type aircraft. The dynamic derivatives investigated in the study were C sub lq, C sub mq, C sub mp, C sub mr, C sub l beta, and C sub n beta. For the cross-coupling derivatives, C sub lq was shown to have the most significant effect on the level and 3-g turning flight motion, followed by C sub nq and C sub mp with the derivative C sub mr showing little to negligible effect in the same regime. For the acceleration derivatives, C sub l beta was shown to have a significant influence on the aircraft motion. The C sub n beta derivative had little effect on the simulated motion. The analysis also documents the configuration dependency of the cross-coupling derivatives and investigates the effects of nonlinear variations in the derivatives on the aircraft motion. GRA

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N80-20284# Transportation Systems Center, Cambridge, Mass.
AIRPORT GROUND ACCESS Final Report
M. Gorstein, L. Frenkel, and R. Marek (FAA, Washington, D.C.) Washington FAA Oct. 1978 371 p refs
(AD-A068974; FAA-EM-79-4) Avail: NTIS HC A16/MF A01 CSCL 01/5

Ground access to airports is studied in terms of constrains on airport capacity and air travel. Case studies of sixteen commercial airports of various sizes and locales were prepared. Specific topics discussed include: the access capacity of representative airports; whether access needs at these airports are adequately considered in the planning process; potential solutions to noted access problems; and identification of projects for consideration by local public bodies and planning authorities which may improve airport access in selected cases. A 1978 update of the ground access to airports study prepared by the Federal Highway Administration (FHWA) is included. J.M.S.

N80-20285*# Old Dominion Univ. Research Foundation, Norfolk, Va.
SCALE MODEL STUDIES FOR ESTABLISHING THE FLOW PATTERNS OF A LOW-SPEED TUNNEL Progress Report, 15 Mar. - 14 Sep. 1979
P. S. Barna Hampton, Va. NASA. Langley Res. Center Mar. 1980 73 p refs
(Grant NsG-1563)
(NASA-CR-159234) Avail: NTIS HC A04/MF A01 CSCL 14B

Experiments were conducted in a model tunnel scaled down in a ratio of 1:24 from the full size prototype V/STOL tunnel at NASA Langley Research Center. The flow characteristics around the tunnel were studied and the location and causes of local flow separation and local recirculation were documented. The study of the interaction between the various components from which the tunnel is built, an experimental setup similar to the sequence of tunnel circuit components was constructed which enabled the various components to be tested either individually or in combination. The components were tested by the simple technique of blowing air through them, then measuring the velocity distribution at relevant sections. A.R.H.

N80-20286*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
REAL-TIME DATA REDUCTION CAPABILITIES AT THE LANGLEY 7 BY 10 FOOT HIGH SPEED TUNNEL
Charles H. Fox, Jr. Jan. 1980 317 p refs
(NASA-TM-78801) Avail: NTIS HC A14/MF A01 CSCL 14B

The 7 by 10 foot high speed tunnel performs a wide range of tests employing a variety of model installation methods. To support the reduction of static data from this facility, a generalized wind tunnel data reduction program had been developed for use on the Langley central computer complex. The capabilities of a version of this generalized program adapted for real time use on a dedicated on-site computer are discussed. The input specifications, instructions for the console operator, and full descriptions of the algorithms are included. J.M.S.

N80-20287# Environmental Engineering Consultants, Inc., Gainesville, Fla.
AEROSOL FILTER LOADING DATA FOR A SIMULATED JET ENGINE TEST CELL AEROSOL Final Report, Jan. - Jul. 1979
Dale A. Lundgren Tyndall AFB, Fla. Air Force Engineering and Services Center Aug. 1979 44 p
(Contract F08637-79-M-0784; AF Proj. 1900)
(AD-A078779; ESL-TR-79-28) Avail: NTIS HC A03/MF A01 CSCL 21/5

The Air Force routinely tests turbine engines in fixed test cells, some of which have been cited by state pollution control officials for violations of opacity regulations. A previous theoretical study, CEEDO-TR-78-53, predicted that relatively low efficiency and low cost techniques could bring jet engine test cells into compliance with air pollution regulations. The system proposed included a water cooling spray and a mist eliminator followed by a medium efficiency, high velocity, throw-away type glass filter media. The most serious limitation of velocity filtration is the aerosol mass loading and the potential for rapid pressure drop build up across the filter. Since filter loading characteristics could not be theoretically predicted, the objective of this follow-on work was to experimentally test and report the filter loading characteristics of glass fiber filters for possible application to jet engine test cell exhaust plume opacity control. Two types of glass fiber media were tested: (1) two different medium efficiency pre-filter media; and (2) two different high efficiency final filter media. GRA

N80-20288# National Technical Information Service, Springfield, Va.
AIRFIELD PAVEMENT EVALUATION, VOLUME 4. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report
Guy E. Habercom, Jr. Jul. 1979 199 p Supersedes NTIS/PS-78/0685; NTIS/PS-77/0662; NTIS/PS-76/0581
(NTIS/PS-79/0754/6; NTIS/PS-78/0685; NTIS/PS-77/0662; NTIS/PS-76/0581) Avail: NTIS HC $28.00/MF $28.00 CSCL 01E

Durability, wear resistance, skid resistance, and surface qualities of airfield pavement structures are analyzed and evaluated. This updated bibliography contains 187 abstracts, 3 of which are new entries to the previous edition. GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

No abstracts in this category.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N80-20289*# Analytical and Computational Mathematics, Inc., Houston, Tex.
CODING, TESTING AND DOCUMENTATION OF PROCESSORS FOR THE FLIGHT DESIGN SYSTEM Final Report
22 Feb. 1980 24 p
(Contract NAS9-15787)
(NASA-CR-160552; ACM-TR-120) Avail: NTIS HC A02/MF A01 CSCL 22A

The general functional design and implementation of processors for a space flight design system are briefly described. Discussions of a basetime initialization processor; conic, analytical, and precision coasting flight processors; and an orbit lifetime processor are included. The functions of several utility routines are also discussed. M.G.

N80-20290# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ORBITAL ESTIMATION USING TWO-BODY CLASSICAL ORBITAL ELEMENTS AS MEASUREMENT UPDATES M.S. Thesis
Daryl G. Boden Dec. 1979 122 p refs
(AD-A079903; AFIT/GA/AA/79D-3) Avail: NTIS HC A06/MF A01 CSCL 22/3

Currently, the Space Defense Center (SDC) uses the position and velocity data of a satellite track to update the orbital elements of the satellite. An alternate approach would be to process the radar data at the tracking site and transmit two-body orbital elements to SDC as measurement updates. This would significantly reduce the data load at SDC. The truth model used in this study to evaluate performance and provide measurement updates to the filters includes the first four zonal harmonics and the first sectoral harmonic of the geopotential and the air drag. The estimator models include two-body dynamics and J sub 2 perturbations. In addition, the derivative of the semi-major axis is used to estimate the effects due to air drag. Perfect dynamics with measurement noise are assumed for the filter models. Three filters are evaluated; Least Squares, Bayes, and Kalman. The performance of the three filters is similar. The Bayes and Kalman Filters are nearly the same and indistinguishable in this study. All three filters performed adequately with the following exceptions. The filters diverge when singularities are present in the classical orbital elements. All three filters underestimate the covariance of the estimates. Finally, the filters track noise in the estimate of the derivative of the semi-major axis, degrading the prediction capabilities of the filters. GRA

N80-20291# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
USE OF AN AERODYNAMIC TURN TO MAXIMIZE THE ORBIT INCLINATION CHANGE FOR THE SPACE SHUTTLE ORBITER M.S. Thesis
Glenn S. Geary Dec. 1979 82 p refs
(AD-A079855; AFIT/GA/AA/79D-4) Avail: NTIS HC A05/MF A01 CSCL 22/1

Previous studies have shown that the space shuttle orbiter can achieve larger orbit inclination changes using an aerodynamic turn than can be obtained using a rocket motor burn. This analysis determines the angle of attack and bank angle histories which maximize the change in inclination angle while satisfying final altitude and velocity loss constraints. The angle of attack and bank angle are modelled as polynomial functions of time with unknown coefficients. The optimum values of the coefficients are determined by a gradient optimization technique. Additionally, the sensitivity of the change in inclination angle to changes in the orbit apogee altitude is examined. It is shown that the space shuttle orbiter can obtain higher inclination angle changes with higher apogee altitudes. GRA

N80-20292# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
STABILIZING AN UNSTABLE ORBIT ABOUT L3 IN THE SUN, EARTH, MOON SYSTEM USING LINEAR CONSTANT GAIN FEEDBACK M.S. Thesis
Doyne E. Smith Dec. 1979 80 p refs
(AD-A079860; AFIT/GA/AA/79D-10) Avail: NTIS HC A05/MF A01 CSCL 22/3

Equations of motion for a satellite in a planar, elliptic four-body system are used to generate an orbit about L3. Initial conditions and a periodic reference orbit were found using a circular four-body model. Linear constant gain feedback is used to stabilize the orbit about L3 in the planar, elliptic four-body model. The computed L3 orbit is plotted against the reference orbit to assess the effectiveness of position, velocity and position/velocity feedback compensation systems. Also computed is the integrated control gain costs for each type of feedback system used. Long term

stable motion near libration point L3 was achieved using position/velocity feedback compensation. Position and velocity feedback when used separately were ineffective as stabilizing feedback compensation systems. The integrated control gain costs also indicate that linear constant gain feedback is not an economical method to stabilize this periodic orbit about L3.GRA

N80-20293# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
APPLICATION AND COMPARISON OF STABLE PERIODIC ORBITS IN THE VICINITY OF LAGRANGIAN POINTS L4 AND L5 TO A FOUR-BODY TRUTH MODEL M.S. Thesis
William D. Beekman Dec. 1979 126 p refs
(AD-A079883; AFIT/GA/AA/79D-2) Avail: NTIS HC A07/MF A01 CSCL 22/3

All previously discovered stable periodic orbits about the triangular libration points are tested on a planar restricted four-body truth model. The truth model is an algorithm developed from equations used by T. A. Heppenheimer for colony location used perturbation theory and the equation of the center. Only one of the orbits, developed by Wheeler using a very restricted four-body problem with Sun - Moon - Earth circular motion, is found to be relatively stable for at least twenty years. It is prograde about L4 having a period in resonance with the lunar synodic month. Two other orbits, one similar to Wheeler's and one 180 degrees out of phase found by Kolenkiewicz and Carpenter are marginally stable. GRA

N80-20294# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
NAVPAC: A SPACE-QUALIFIED NAVIGATION PACKAGE
D. L. Zitterkopf Feb. 1979 150 p
(Contract N00017-72-C-4401)
(AD-A077062; APL/JHU-TG-1317) Avail: NTIS HC A07/MF A01 CSCL 22/3

NAVPAC (Navigation Package) is a space-qualified receiver instrument designed and developed by APL for the Defense Mapping Agency. The use of NAVPAC represents the first application of the Navy Navigation Satellite System to reconstruct accurately the orbit of another space vehicle. It also represents the first system for automatically providing a precise time-annotation capability for an event that occurs on a spacecraft. NAVPAC contains three dual-channel receivers to acquire and track signals automatically from as many as three Navy Navigation Satellites that are in view simultaneously. To help meet the program goals, NAVPAC also includes a three-axis miniature electrostatic accelerometer. The goals of NAVPAC include accurately reconstructing a host-vehicle orbit, providing atmospheric density information, and improving the gravity field model. GRA

N80-20295# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DETERMINATION OF THE MINIMUM DELTA 5 TRANSFER TRAJECTORY FROM A LOW EARTH ORBIT TO A STABLE ORBIT AROUND THE LAGRANGIAN POINT L4 IN A RESTRICTED FOUR-BODY SYSTEM M.S. Thesis
Theron E. Weimer Dec. 1979 114 p refs
(AD-A079881) Avail: NTIS HC A06/MF A01 CSCL 22/3

In this report, the equations of motion for a satellite in restricted four-body motion are derived and examined. An algorithm is developed that produces a minimum delta 5 transfer trajectory from a low Earth orbit to establishment in Wheeler's stable periodic orbit around L4. Both a Hohmann transfer and an infinite velocity, straight-line transfer are examined as initial conditions for integration of the equations of motion. Transfer trajectories are determined to ten points around Wheeler's orbit so that a minimum delta 5 trajectory can be determined. Two types of minimum delta 5 values were found. One type is a true minimum value, the other type is a limiting value beyond which the target orbit cannot be reached. Results are presented on a transfer trajectory that gives a minimum delta 5 from the points examined. From these results a more accurate transfer location is estimated. GRA

N80-20701# Bayerische Akademie der Wissenschaften, Munich (West Germany).
ON THE USE OF LINES OF KERNEL FUNCTIONS FOR ORBITAL DETERMINATION [DIE NUTZUNG VON KERN-FUNKTIONSREIHEN ZUR BAHNBESTIMMUNG]
Hermann Hauck *In its* Res. Program 78, Satellite Geodesy Program 1978 p 102-108 refs In GERMAN (For primary document see N80-20691 11-42)
Avail: NTIS HC A09/MF A01

N80-20703# Bayerische Akademie der Wissenschaften, Munich (West Germany).
MOTION OF ARTIFICIAL EARTH SATELLITES IN RELATED ORBITS [ZUR BEWEGUNG KUENSTLICHER ERDSATGEL-LITEN IN BENACHBARTEN UMLAUFBAHNEN]
Karl Heinz Ilk and Wolfgang Seemueller *In its* Res. Program 78, Satellite Geodesy Program 1978 p 120-138 refs In GERMAN (For primary document see N80-20691 11-42)
Avail: NTIS HC A09/MF A01

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N80-20296# ARO, Inc., Arnold Air Force Station, Tenn.
SPACECRAFT TEST CHAMBER CONTAMINATION STUDY IN THE AEDC MARK 1 FACILITY Final Report, Apr.-Jul. 1977
J. G. Pipes, D. F. Frazine, R. P. Young, E. N. Borson, and L. H. Rachal AEDC, Arnold AFS, Tenn. Jan. 1980 26 p refs
(AD-A079838; AEDC-TR-79-41) Avail: NTIS HC A03/MF A01 CSCL 14/2

Recent results of a contamination study in the Arnold Engineering Development Center Mark 1 space simulation chamber are presented. The measurements were associated with the Global Positioning System satellite test conducted in the Mark 1 facility between April 6, 1977, and July 24, 1977. Multiple internal reflection spectroscopy (MIRS) internal reflection elements (IRE's), thermal control surface witness plates, and quartz crystal microbalances (QCM's) were used to measure contaminants condensible during an extended chamber evacuation. An automatic particle counter was used to measure airborne particle density when the chamber was at atmospheric pressure. The nonvolatile residue wipe technique was employed to determine the general cleanliness of the chamber hardware. Temperature of the IRE's during chamber operation was between 150 and 200 K. One QCM was temperature controlled to a temperature of 238 K; the other QCM operated at 135 K. After chamber repressurization, the IRE's were scanned in the 2- to 15- micrometer wavelength region. Resulting spectra indicated a coating of diffusion pump fluid (DC704) at a concentration level just above the limit of detectability. GRA

N80-20641# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE SATELLITE STATION WETZELL [DIE SATELLITENB-EOBACHTUNGSSTATION WETTZELL]
Hermann Seeger *In its* Rept. on Cartography and Geodesy, Ser. 1: Original Rept. No. 73 1977 p 53-62 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20646# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
PARTICIPATION OF SATELLITE OBSERVATION STATION WETZELL IN INTERNATIONAL OBSERVATION PROGRAMS, 1975-1977 [ZUR BETEILIGUNG DER SATELLITENBEOBAC-HTUNGSSTATION WETZELL AN INTERNATIONALGEN BEOBACHTUNGSPROGRAMMEN (1975-1977)]
Hermann Seeger and Peter Wilson *In its* Rept. on Cartography and Geodesy, Ser. 1: Original Rept. No. 73 1977 p 93-103

refs In GERMAN (For primary document see N80-20838 11-42)
Avail: NTIS HC A11/MF A01

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N80-20297# Army Missile Command, Redstone Arsenal, Ala. Technology Lab.
SAMPLED-DATA ANALYSIS IN PARAMETER SPACE
S. M. Seltzer Jun. 1979 31 p refs
(AD-A077879; DRSMI-T-79-64) Avail: NTIS HC A03/MF A01 CSCL 14/2

This report describes a technique for determining the stability and dynamic characteristics of a digital control system in terms of several selected system parameters. The method requires that the system characteristic equation be available in the complex z-domain. An example is provided to further elucidate the technique. It is this capability that makes the method more powerful than most design techniques (which describe stability in terms of only one variable parameter or gain). GRA

N80-20298# Alabama Univ., Tuscaloosa.
SOURCES OF TRACKING ERROR IN MILLIMETER WAVELENGTH MISSILE GUIDANCE SYSTEMS
William Webb 31 May 1979 52 p refs
(Contract DAAG29-76-D-D100)
(AD-A078226; DRSMI-T-79-57) Avail: NTIS HC A04/MF A01 CSCL 17/7

A number of sources of error degrade the tracking performance of practical millimeter radars. These include receiver noise, target noise, multipath, clutter, servo noise and propagation effects. In this technical note, these error sources are considered, and the available techniques for minimizing their influence are reviewed. A detailed analysis of a typical millimeter radar tracking a military target has been performed in order to evaluate the relative importance of the different sources of tracking error. Both frequency agile and fixed frequency operation are considered. GRA

N80-20299# Naval Surface Weapons Center, Dahlgren, Va.
EFFECT OF LINEAR APPROXIMATION FOR SATELLITE DOPPLER FREQUENCY IN GEODETIC POSITIONING Final Report
C. Harris Seay Oct. 1979 23 p refs
(AD-A078128; NSWC/TR-79-256) Avail: NTIS HC A02/MF A01 CSCL 17/7

The Doppler principle has been used to track satellites since the early 1960's. When the data sampling interval was less than one second, this data has been treated as frequency data in orbit determination programs. This method results in an approximation when the number of cycles counted in an interval divided by the time interval is treated as a frequency in the equations of condition. The result of this truncated series is that it produces station heights that are about 1.4 meters too low. Therefore the data must be treated as range differences, even for sampling intervals as low as 1 second. GRA

N80-20300# RDP, Inc., Waltham, Mass.
AFSIM, AN AIR FORCE SATTELLITE INTERACTIONS MODEL Interim Report
Andrew Mazzella, Emile Tobenfeld, and Allen G. Rubin 29 Jun. 1979 16 p refs
(Contract F19628-76-C-0212; AF Proj. 7661)
(AD-A078032; AFGL-TR-79-0138; ERP-664) Avail: NTIS HC A02/MF A01 CSCL 22/1

A computer program called AFSIM has been developed to conduct numerical simulations of plasma interactions with a satellite, assuming the satellite to be represented by an infinitely long cylinder and treating the plasma as discrete particles. The system is assumed to be uniform along the axis of the satellite. A number of features of the actual satellite are incorporated into the model with as much flexibility as possible to accommodate a wide range of conditions. GRA

N80-20301# Army Electronics Research and Development Command, White Sands Missile Range, N. Mex. Atmospheric Sciences Lab.
SATELLITE CALIBRATION DATA, ANNUAL DATA REPORT Progress Report, Jan. - Dec. 1977
L. I. Murillo and L. Edwin Williamson Aug. 1979 406 p
(DA Proj. 1L1-62111-AH-71)
(AD-A075602; ERADCOM/ASL-DR-79-0001) Avail: NTIS HC A18/MF A01 CSCL 22/2

This report contains data from observations of meteorological and radiative parameters at selected satellite calibration target sites. These sites include the highly reflective gypsum field in southcentral New Mexico, a dark lava surface, a nearby fresh water reservoir and over desert terrain. The report also contains narrative descriptions of the instruments in use at the target sites. GRA

N80-20694# Bayerische Akademie der Wissenschaften, Munich (West Germany).
ON THE VERIFICATION OF SATELLITE REFLECTANCE MEASUREMENTS [ZUR UEBERPRUFFUNG VON ENTFERNUNGSMESSUNGENNACH SATELLITEN]
Helmut Walter *In its* Res. Program 78, Satellite Geodesy Program 1978 p 38-44 refs In GERMAN (For primary document see N80-20691 11-42)
Avail: NTIS HC A09/MF A01

N80-20697# Bayerische Akademie der Wissenschaften, Munich (West Germany).
THE EROS-DOPPLER OBSERVATION CAMPAIGN (EROS-DOC) [DIE EROS DOPPLER BEOBACHTUNGSKAMPAGNE (EROS-DOC)]
Wolfgang Schluster, Hermann Seeger, Gerhard Soltau, Peter Wilson, and Peter Wolf *In its* Res. Program 78, Satellite Geodesy Program 1978 p 65-71 refs In GERMAN (For primary document see N80-20691 11-42)
Avail: NTIS HC A09/MF A01

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N80-20302*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STRUCTURAL TESTS ON A TILE/STRAIN ISOLATION PAD THERMAL PROTECTION SYSTEM
Jerry G. Williams Mar. 1980 46 p
(NASA-TM-80226) Avail: NTIS HC A03/MF A01 CSCL 22B

The aluminum skin of the space shuttle is covered by a thermal protection system (TPS) consisting of a low density ceramic tile bonded to a matted-felt material called strain insulation pad (SIP). The structural characteristics of the TPS were studied experimentally under selected extreme load conditions. Three basic types of loads were imposed: tension, eccentrically applied tension, and combined in-plane force and transverse pressure. For some tests, transverse pressure was applied rapidly to simulate a transient shock wave passing over the tile. The failure mode for all specimens involved separation of the tile from the SIP at the silicone rubber bond interface. An eccentrically applied tension load caused the tile to separate from the SIP at loads lower than experienced at failure for pure tension loading. Moderate in-plane as well as shock loading did not cause a measurable reduction in the TPS ultimate failure strength. A strong coupling, however, was exhibited between in-plane and transverse loads and displacements. Author

N80-20303*# Boeing Aerospace Co., Seattle, Wash.
TECHNOLOGY REQUIREMENTS FOR FUTURE EARTH-TO-GEOSYNCHRONOUS ORBIT TRANSPORTATION SYSTEMS.

VOLUME 3: APPENDICES Final Report
Vincent A. Caluori, Robert T. Conrad, and James C. Jenkins Hampton, Va. NASA Langley Res. Center Mar. 1980 146 p
(Contract NAS1-15301)
(NASA-CR-159174) Avail: NTIS HC A07/MF A01 CSCL 22B

Technological requirements and forecasts of rocket engine parameters and launch vehicles for future Earth to geosynchronous orbit transportation systems are presented. The parametric performance, weight, and envelope data for the LOX/CH4, fuel cooled, staged combustion cycle and the hydrogen cooled, expander bleed cycle engine concepts are discussed. The costing methodology and ground rules used to develop the engine study are summarized. The weight estimating methodology for winged launched vehicles is described and summary data used to evaluate and compare weight data for dedicated and integrated O2/H2 subsystems for the SSTO, HLLV and POTV are presented. Detail weights, comparisons, and weight scaling equations are provided. A.W.H.

N80-20304*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LeRC REDUCED GRAVITY FLUID MANAGEMENT TECHNOLOGY PROGRAM
John C. Aydelott and E. Patrick Symons [1980] 19 p refs Prepared for the 1980 JANNAF Propulsion Meeting, Monterey, Calif., 11-13 Mar. 1980
(NASA-TM-81450; E-371) Avail: NTIS HC A02/MF A01 CSCL 22A

A survey of the reduced gravity fluid management technology program is presented. Information on reduced gravity fluid behavior, techniques for thermal control of cryogenic tankage, and design for fluid management systems are discussed. The development of Spacelab experiments, propellant management systems for orbit transfer vehicles, and computer techniques for simulating reduced gravity fluid dynamic processes is reported. A.W.H.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N80-20305# Pacific Missile Test Center, Point Mugu, Calif. Weapons Instrumentation Div.
MINICOMPUTER CONTROLLED SYSTEM FOR TESTING TELEMETRY RECEIVING AND RECORDING SYSTEMS
E. L. Law and G. J. Harbold, Jr. 10 Oct. 1979 53 p
(AD-A078803; PMTC-TP-79-30) Avail: NTIS HC A04/MF A01 CSCL 19/6

This report describes a minicomputer controlled system for testing telemetry receiving and recording stations and presents sample test results. Details of the interface between the minicomputer and the test equipment are also presented. The system can test a telemetry receiving and recording station in about one/fifth the time it takes to manually test the station. The test results are printed out and can be stored on the computer for trend analysis and other statistical analyses. The system accuracy is + or - 1.0 dB or better for all tests. The results of the various tests correlate well with each other and with manually performed tests. It has been demonstrated that a minicomputer controlled system can perform a good, fast, accurate test on a telemetry receiving and recording station. GRA

N80-20643# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
CONTRIBUTIONS OF THE SF8 78/IFAG TO DOPPLER MEASUREMENTS FOR SATELLITE POSITIONING [DIE ARBEITEN DES SF8 78/IFAG AUF DEM GEBIET DER DOPPLERMESSUNGEN NACH SATELLITEN]
Peter Wilson and Hermann Seeger *In its* Rept. on Cartography and Geodesy, Ser. 1, Original Rept. No. 73 1977 p 73-80 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

No abstracts in this category.

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N80-20306*# United Technologies Corp., South Windsor, Conn.
LIGHTWEIGHT FUEL CELL POWERPLANT COMPONENTS PROGRAM Final Report, 18 Mar. 1974 - 31 Dec. 1979
R. E. Martin 22 Feb. 1980 103 p refs
(Contract NAS8-30637)
(NASA-CR-161412; FCR-1656) Avail: NTIS HC A06/MF A01 CSCL 10B

A lightweight hydrogen-oxygen alkaline fuel cell incorporated into the design of a lightweight fuel cell powerplant (LFCP) was analytically and experimentally developed. The powerplant operates with passive water removal which contributes to a lower system weight and extended operating life. A preliminary LFCP specification and design table were developed along with a lightweight power section for the LFCP design, consisting of repeating two-cell modules was designed. Two, four-cell modules were designed incorporating 0.508 sq ft active area space shuttle technology fuel cells. Over 1,200 hours of single-cell and over 8,800 hours of two-cell module testing was completed. The 0.25 sq ft active area lightweight cell design was shown to be capable of operating on propellant purity reactants out to a current density of 600ASF. Endurance testing of the two-cell module configuration exceeded the 2,500-hour LFCP voltage requirements out to 3700-hours. A two-cell module capable of operating at increased reactant pressure completed 1000 hours of operation at a 30 psia reactant pressure. A lightweight power section consisting of fifteen, two-cell modules connected electrically in series was fabricated. J.M.S.

N80-20307# SRI International Corp., Arlington, Va.
IMPACT FUSION WITH A SEGMENTED RAIL GUN
R. A. Muller, R. L. Garwin, and B. Richter Dec. 1979 16 p refs

(Contract EY-76-C-03-0115)
(AD-A079811; SRI-JSN-79-05) Avail: NTIS HC A02/MF A01 CSCL 21/3

The rail gun offers an attractive alternative to the traveling wave rifle for the magnetic acceleration of macroscopic (0.05 g) bullets for impact fusion. In this paper we review the basic rail gun equations and indicate how energy efficiency can be designed into it. We set as our preliminary goal the delivery of 1 megajoule in 10 nanoseconds, with a specific energy of 20 MJ/g (i.e. a bullet mass of 0.05 g); these values are taken from the requirements being considered for heavy-ion fusion. Using these numbers the final particle velocity is 200 km/sec. For a delivery time of 10 nanoseconds, this velocity implies that the projectile length is about 2 mm. Impact fusion is feasible because of the coincidence that a bullet with all dimensions, roughly 2 mm has the required mass. GRA

N80-20308# Rockwell International Corp., Downey, Calif. Satellite Systems Div.
SOLAR ROCKET SYSTEM CONCEPT ANALYSIS Final Report, 19 Feb. - 30 Sep. 1979
Fred G. Etheridge Dec. 1979 233 p refs
(Contract F04611-79-C-0007; AF Proj. 5730)
(AD-A079117; SSD-79-175; AFRPL-TR-79-79) Avail: NTIS HC A11/MF A01 CSCL 21/8

The objective of the solar rocket concept analysis was to determine the potential value of solar-thermal rockets in large delta velocity space missions. A specific impulse of 872 seconds was achieved by passing hydrogen through a heat exchanger placed at the focal spot of a large parabolic dish solar concentrator mirror. With a windowed chamber type of thruster and a particle-laden hydrogen flow the specific impulse was 1041 seconds. Inflatable construction techniques were determined to be optimum for the large concentrating mirrors based on ease of deployment and low specific mass. It was concluded that the solar rocket offers the mission planner a viable option between the high payload-long trip time of the mercury ion bombardment system and the lower payload-short trip time of a LO2-LH2 stage. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N80-20309# Rockwell International Corp., Golden, Colo. Energy System Div.
CHEMISTRY RESEARCH AND DEVELOPMENT Progress Report, Nov. 1978 - Apr. 1979
F. J. Miner 5 Oct. 1979 35 p refs
(Contract EY-76-C-04-3533)
(RFP-2952) Avail: NTIS HC A03/MF A01

The status of the following studies is given: calorimetry and thermodynamics of nuclear materials; optimization of the cation exchange process for recovering americium and plutonium from molten net extraction residues; evaluation and comparison of bidentate extractants and methods for actinide recovery; an anion exchange-bidontate organophosphorus extraction process for molten salt extraction residues; plutonium recovery in the Advanced Size Reduction Facility; decontamination of Rocky Flats soil; separating lead and calcium from americium by chromate and oxalate precipitation; demonstration of the pyroredox process in the induction heated, tilt-pour furnace; process development for recovery of americium from vacuum melt furnace crucibles; plutonium peroxide precipitation process; and a comparative study of annular and Raschig ring-filled tanks. DOE

24 COMPOSITE MATERIALS

Includes laminates.

N80-20310 Virginia Univ., Charlottesville.
INVESTIGATION OF ELONGATION OF BORON FILAMENT DURING FABRICATION AND ANNEALING Ph.D. Thesis
Jimmy Wayne Eason 1979 159 p
Avail: Univ. Microfilms Order No. 8004675

Elongation in boron filament during fabrication was investigated and found to be as great as 16 percent under certain conditions. It was also found to obey a relatively simple empirical relationship which yielded effective activation energies. A model for the elongation was proposed, and a computer program was designed to simulate the deposition and elongation of boron on a tungsten wire substrate. Internal residual stress distribution of boron/tungsten filament were also generated by the computer program. Good agreement was found between the proposed model and experimental results. Negative elongation (contraction) of boron filament was observed during annealing and found to be dependent upon the concentration of oxygen present in the annealing atmosphere. The contraction was also found to be the result of void formation at the core-born sheath interface. Dissert. Abstr.

N80-20311*# Little (Arthur D.), Inc., Cambridge, Mass.
AN ASSESSMENT OF THE RISKS PRESENTED BY CARBON FIBER COMPOSITES RELEASED FROM MOTOR VEHICLE FIRES
Donald B. Rosenfield, Joseph Fiksel, and Ashok Kalelkar Hampton, Va. NASA Langley Research Center Mar. 1980 87 p refs
Sponsored in part by DOT
(Contract NAS1-15380)
(NASA-CR-159207; DOT-TSC-RSPA-80-4) Avail: NTIS HC A05/MF A01 CSCL 11D

A risk assessment was conducted to estimate the potential losses through 1993 due to the usage of carbon fiber (CF) composites in U.S. motor vehicles, including automobiles and trucks. A methodology was developed to compute estimated dollar losses by county and equipment type, using a Poisson model for the incidence of equipment failures. This approach incorporated data on the geographic distribution of potentially vulnerable facilities, as well as the mean CF exposure levels at which various equipment would fail. The results were then statistically aggregated to produce a national risk profile for estimated annual losses in 1993. The expected loss was $5,567 per year (1977 dollars), and the likelihood of exceeding $500,000 in annual losses was estimated to be at most one in ten thousand. The sensitivity of these results to major input parameters was investigated, and it was found that under extreme worst-case assumptions the annual loss would increase to about $1.5 million. J.M.S.

N80-20312*# Pennsylvania Univ., Philadelphia. Dept. of Electrical Engineering and Science.
HIGH ELECTRICAL RESISTIVITY CARBON/GRAPHITE FIBERS Final Report
F. Lincoln Vogel and William C. Forsman 17 Apr. 1980 26 p refs
(Grant NsG-1596)
(NASA-CR-162909) Avail: NTIS HC A03/MF A01 CSCL 11D

Carbon/graphite fibers were chemically oxidized in the liquid phase to fibers of graphite oxide. Resistivity increases as high as 10,000 times were obtained, the oxidized fiber decomposed on exposure to atmosphere. A factor of 1,000 remained as a stable increment. The largest change observed was 1,000,000 times. Best results were obtained on the most highly graphitized fibers. Electrochemical oxidation yielded a lower increase--about 10 times, but provided a controllable method of synthesis and insight to the mechanism of reaction. Tensile tests indicated that the strength of the fiber on oxidation was decreased by no more than 25 percent. Author

N80-20313*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DYNAMIC MODULUS AND DAMPING OF BORON, SILICON CARBIDE, AND ALUMINA FIBERS
J. A. DiCarlo and W. Williams [1980] 44 p refs Presented at the 4th Ann. Conf. on Composites and Advanced Mater., Cocoa Beach, Fla. 20-24 Jan. 1980; sponsored by the Am. Ceram. Soc.

(NASA-TM-81422; E-345) Avail: NTIS HC A03/MF A01 CSCL 11D

The dynamic modulus and damping capacity for boron, silicon carbide, and silicon carbide coated boron fibers were measured from -190 to 800 C. The single fiber vibration test also allowed measurement of transverse thermal conductivity for the silicon carbide fibers. Temperature dependent damping capacity data for alumina fibers were calculated from axial damping results for alumina-aluminum composites. The dynamics fiber data indicate essentially elastic behavior for both the silicon carbide and alumina fibers. In contrast, the boron based fibers are strongly anelastic, displaying frequency dependent moduli and very high microstructural damping. The single fiber damping results were compared with composite damping data in order to investigate the practical and basic effects of employing the four fiber types as reinforcement for aluminum and titanium matrices. K.L.

N80-20314*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CALCULATION OF RESIDUAL PRINCIPAL STRESSES IN CVD BORON ON CARBON FILAMENTS

Donald R. Behrendt [1980] 15 p refs Prepared for the 4th Ann. Conf. on Composites and Advanced Mater., Cocoa Beach, Fla., 21-24 Jan. 1980; sponsored by the Am. Ceram. Soc.

(NASA-TM-81456; E-386) Avail: NTIS HC A02/MF A01 CSCL 11D

A three-dimensional finite element model of the chemical vapor deposition of boron on a carbon substrate (B/C) is developed. The model includes an expansion of the boron after deposition due to atomic rearrangement and includes creep of the boron and carbon. Curves are presented showing the variation of the principal residual stresses and the filament elongation with the parameters defining deposition strain and creep. The calculated results are compared with experimental axial residual stress and elongation measurements made on B/C filaments. For good agreement between calculated and experimental results, the deposited boron must continue to expand after deposition, and the build up of residual stresses must be limited by significant boron and carbon creep rates. K.L.

N80-20315*# SRI International Corp., Menlo Park, Calif.

DEVELOPMENT OF LaRC 160/NR150B2 POLYIMIDE GRAPHITE HYBRID COMPOSITES

Milan G. Maximovich, O. Bergren, and S. Lockerby Mar. 1980 61 p refs

(Contract NAS1-15433)

(NASA-CR-159196) Avail: NTIS HC A04/MF A01 CSCL 11D

A method for co-curing NR150B2 and LaRC 160 prepregs into hybrid composites was developed. The processing characteristics and the properties of the hybrid composites were compared with those of laminates fabricated from the individual component prepregs. Resin forms were selected and optimized and a new NR150 formulation was investigated. The new formulation greatly facilitated the processing and the performance of this system. Quality control techniques were evaluated and developed, high quality laminates were fabricated from both individual resin systems, and hybrid laminates were successfully co-cured. Optimum hybrid forms were investigated and several novel approaches were explored. An optimum hybrid system was developed that utilizes a LaRC curing schedule but shows no degradation of mechanical properties after aging 500 hr in air at 260 C. J.M.S.

N80-20316*# Boeing Aerospace Co., Seattle, Wash.

DESIGN, FABRICATION AND TEST OF GRAPHITE/POLYIMIDE COMPOSITE JOINTS AND ATTACHMENTS FOR ADVANCED AEROSPACE VEHICLES Quarterly Technical Progress Report, 1 Jul. - 30 Sep. 1979

D. E. Koumal Washington NASA Oct. 1979 92 p refs

(Contract NAS1-15644)

(NASA-CR-159110; QTPR-3) Avail: NTIS HC A05/MF A01 CSCL 11D

The design and evaluation of built-up attachments and bonded joint concepts for use at elevated temperatures is documented. Joint concept screening, verification of GR/PI material, fabrication of design allowables panels, definition of test matrices, and analysis of bonded and bolted joints are among the tasks completed. The results provide data for the design and fabrication of lightly loaded components for advanced space transportation systems and high speed aircraft. K.L.

N80-20317*# Bionetics Corp., Hampton, Va.

THE VULNERABILITY OF COMMERCIAL AIRCRAFT AVIONICS TO CARBON FIBERS

Jerome A. Meyers and Seymour Salmirs Hampton, Va. NASA. Langley Res. Center Apr. 1980 50 p refs

(Contract NAS1-15238)

(NASA-CR-159213) Avail: NTIS HC A03/MF A01 CSCL 11D

Avionics components commonly used in commercial aircraft were tested for vulnerability to failure when operated in an environment with a high density of graphite fibers. The components were subjected to a series of exposures to graphite fibers of different lengths. Lengths used for the tests were (in order) 1 mm, 3 mm, and 10 mm. The test procedure included subjecting the equipment to characteristic noise and shock environments. Most of the equipment was invulnerable or did not fail until extremely high average exposures were reached. The single exception was an air traffic control transponder produced in the early 1960's. It had the largest case open area through which fibers could enter and it had no coated boards. K.L.

N80-20318# Aerojet Solid Propulsion Co., Sacramento, Calif. Strategic Systems Div.

STRUCTURAL ASSESSMENT OF INVOLUTES Final Report, Sep. 1977 - Jun. 1979

H. O. Davis and D. F. Vronay Jun. 1979 155 p refs

(Contract F33615-77-C-5051; AF Proj. 2420)

(AD-A077875; AFML-TR-79-4068) Avail: NTIS HC A03/MF A01 CSCL 14B

An apparatus was designed and constructed to use high vacuum and mass spectrometric techniques to determine total and partial vapor pressures above bulk liquid samples in the temperature range between -65 C and 25 C. Observations on the sulfuric acid-water system revealed complexities which interfered with the experimental goal, but which are of some interest in themselves. These interfering processes included long internal thermal relaxation times and chemical reactions. A pressure effect was observed on the melting curve of the sulfuric acid-water mixtures. GRA

N80-20319# ARO, Inc., Arnold Air Force Station, Tenn.

AEROTHERMAL EVALUATION OF HIGH-TEMPERATURE STRUCTURAL MATERIALS FOR USE IN HIGH-PERFORMANCE MISSILE DESIGN Final Report, 11-12 Oct. 1978

J. O. Ievalts and R. K. Matthews AEDC Jan. 1980 44 p refs

(AD-A080023; AEDC-TR-79-38) Avail: NTIS HC A03/MF A01 CSCL 11/4

A materials screening test was conducted in the von Karman Gas Dynamics Facility Wind Tunnel C to determine the performance of several high-temperature, polymeric and metallic composite materials being considered for use as missile structural components. Test conditions were representative of the aerothermal environment encountered during the projected flight of a high-performance, short-range air-to-air missile (SRAAM). GRA

N80-20320# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.

PREDICTION AND VERIFICATION OF MOISTURE EFFECTS ON CARBON FIBER-EPOXY COMPOSITES Progress Report, Oct. 1977 - Oct. 1978

Joseph M. Augl 30 Mar. 1979 47 p refs

(AD-A079557; NSWC/TR-79-43) Avail: NTIS HC A03/MF A01 CSCL 11/4

Moisture has an effect on the elastic as well as on the strength properties of composites. In this work we have experimentally verified the prediction of changes in the longitudinal shear modules G sub 12 as a function of moisture uptake and temperature. The properties of the bulk resin (measured independently as a function of temperature and moisture concentration) were used for predicting the composite response by using the simple Halpin-Tsai equation of micromechanics.

The excellent agreement between the predicted and observed values demonstrates the feasibility of predicting changes in (reversible properties) of composite in a natural service environment as suggested in a previous report. This predictive scheme considered simultaneously the concepts of diffusion, environmental modeling, micromechanics, and a finite difference laminate theory. GRA

N80-20321# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
INVESTIGATION OF IN SITU COMPOSITES FOR ELECTROMAGNETIC DEVICE APPLICATIONS WITH EMPHASIS ON DEVELOPMENT OF MICROWAVE TUBE CATHODES AND HIGH RESOLUTION DISPLAYS Final Technical Report, Jan. 1976 - Nov. 1978
John W. Goodrum Griffiss AFB, N. Y. RADC Sep. 1979 170 p refs
(Contract F19628-76-C-0153; AF Proj. 2306)
(AD-A079698; EES/GIT-A-1815; RADC-TR-79-174) Avail: NTIS HC A08/MF A01 CSCL 11/4

This report documents the results of a study to evaluate the potential of eutectic composite materials for use in electronic, optical and other devices. The composite materials may be a combination of metal-metal, metal-semiconductor, semiconductor-semiconductor, semiconductor-insulator, or insulator-insulator classes of materials. Device concepts, based on eutectic composites, were given preliminary technical and economic evaluation; brief descriptions of promising devices are listed. Eutectic-based cold cathode and display devices were evaluated by experiments to determine the performance of a prototype cathode device and to determine the design requirements for fabrication of a diode-type display. GRA

N80-20322# Sandia Labs., Albuquerque, N. Mex.
TRANSVERSE COMPRESSIVE TESTING OF THICK KEVLAR/EPOXY LAMINATES
T. R. Guess and R. H. Ericksen 1979 14 p Presented at 11th Natl. SAMPE Tech. Conf., Boston, Nov. 1979
(Contracts EY-76-C-04-0789; DE-AC04-76DP-00789)
(SAND-79-0176; CONF-791116-3) Avail: NTIS HC A02/MF A01

A suitable geometry for measuring the transverse compressive properties of Kevlar 49 cloth/epoxy composites was defined. Two geometries and strain measuring methods were evaluated: straight-sided cylinders with strain calculated from total platen displacement (includes specimen end effects), and reduced-section cylinders with strain measured in the reduced gage region (no end effects). The straight-sided specimens had length to diameter ratios between 1.1 and 2.7 and were tested with their ends both dry and lubricated. At stress levels below failure, the stress-strain curves from the reduced-section samples were in good agreement with the straight-sided specimen data. Curves from both geometries lie within the same scatter band. Strength data from the reduced-section specimen were inconclusive. Based on this study, straight-sided cylinders with aspect ratios between 2.25 and 2.50 were selected as suitable specimens for characterizing the transverse compressive properties of thick Kevlar cloth/epoxy laminates. DOE

N80-20323# Illinois Univ., Urbana. Dept. of Physics and Materials Research Lab.
LOW TEMPERATURE THERMAL CONDUCTIVITIES OF GLASSY CARBONS
A. C. Anderson 1979 9 p refs Presented at the 16th Intern. Thermal Conductivity Conf., Chicago, 7 Nov. 1979
(Contract EY-76-C-02-1198)
(COO-1198-1280; CONF-791134-3) Avail: NTIS HC A02/MF A01

The thermal conductivity of glassy carbon in the temperature range 0.1 to 100 K appears to depend only on the temperature at which the material was pyrolyzed. The thermal conductivity was related to the microscopic structure of glassy carbon. The reticulated structure was especially useful for thermal isolation at cryogenic temperatures. DOE

N80-20324# Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.
DAMPING OF ANISOTROPIC COMPOSITES STUDIED FROM THE PROPERTIES OF THE ROLLED COMPONENTS [VERFAHREN ZUR BESTIMMUNG DES DAEMPFUNGSVERHALTENS ANISOTROPER VERBUNDBAUTEILE AUS DEN EIGENSCHAFTEN DER LAMINATKOMPONENTEN]
Klaus Kehl 1978 137 p refs In GERMAN
(ILR-41; ISBN-3-79830-660-5) Avail: NTIS HC A07/MF A01

The rigidity and damping properties of the glass and carbon fiber reinforced plastics (GFK and KFK), were studied as well as applications to determining the frequencies and damping in the rolled product. Coefficients of rigidity for surface planes of disk and plates in the case of linear tension and torsion were calculated. Dynamic behavior, including unidirectional and multidirectional loads for composite materials was analyzed. The influence of temperature, frequency of vibration, and fiber orientation on the behavior of the reinforced plastics, and their applications were determined. The manufacture of membranes, tanks, tubes, and pipes was demonstrated. Author (ESA)

N80-20325*# National Bureau of Standards, Washington, D.C. National Measurement Lab.
ADVANCED COMPOSITES: DESIGN AND APPLICATION. PROCEEDINGS OF THE MEETING OF THE MECHANICAL FAILURES PREVENTION GROUP Final Report
T. Robert Shives and William A. Willard Oct. 1979 307 p refs Conf. held at Gaithersburg, Md., 23-25 May 1979 Sponsored in part by ONR, Arlington, Va., Naval Air Systems Command, Washington D.C., NASA Goddard Space Flight Center., and DOE, Washington, D.C.
(NASA-CR-162864; PB80-105109; NBS-SP-563; LC-79-600151) Avail: NTIS HC A14/MF A01 CSCL 11D

The design and application of advanced composites is discussed with emphasis on aerospace, aircraft, automotive, marine, and industrial applications. Failure modes in advanced composites are also discussed. GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N80-20326 British Library Lending Div., Boston Spa (England).
APPLICATIONS OF LIQUID CHROMATOGRAPHY IN THE FIELD OF SURFACE-ACTIVE COMPOUNDS
P. Kikolski Oct. 1979 13 p refs Transl. into ENGLISH from Tluszezl Sprodki Piorace Kosmetyki (Poland), v. 32, no. 2, 1978 p 22-25
(BLL-RTS-11948) Avail: British Library Lending Div., Boston Spa, Engl.

Application of liquid chromatography to the analysis of detergents is discussed. Application of classical and high performance liquid/liquid, liquid/solid, ion exchange, and gel permeation chromatography to the analysis of detergent raw materials and final products is described. The analysis of nonionic compounds, olefine and paraffin sulfonates, alkanolamides, esters of polyhydric alcohol, and mixtures of various surfectants is discussed. A.W.H.

N80-20327 British Library Lending Div., Boston Spa (England).
ON FLAME SPREAD MECHANISM OVER COMBUSTIBLE SOLID SURFACE
K. Akita Nov. 1979 6 p refs Transl. into ENGLISH from Tokyo Daigaku Kogakubu Kiyo A (Japan), v. 15, 1977 p 70-71
(BLL-RTS-12027) Avail: British Library Lending Div., Boston Spa, Engl.

The mechanism of flame propagation over combustible solid surfaces and its connection to the question of unequal combustion over thick and thin objects was examined. The effects of the size and shape, the flame temperature and direction, the composition of the surrounding atmosphere, and the external air

flow velocity on the flame propagation mechanism were investigated. The size of thickness of the object was emphasized. The results of experiments measuring the rate of flame propagation vertically downwards and horizontally over flat surfaces of poly methyl methacrylate are discussed. A.W.H.

N80-20328 Engineering Sciences Data Unit, London (England).
THERMAL CONDUCTIVITY OF LIQUID CARBOXYLIC ACIDS
1979 9 p
(ESDU-79029; ISBN-0-85679-277-2) Copyright. For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $194.50

Values of thermal conductivity at saturation pressure are presented in tabular form for the liquid aliphatic carboxylic acids which are members of the following groups: n-alkanoic acids, isoalkanoic acids, and unsaturated alkanoic acids. The data on which these recommended values of thermal conductivity are based are the most reliable available and the range covered is from the melting point to approximately 0.9 of the critical temperature. The procedure used to obtain the values of thermal conductivity is presented and indicates the effect of pressure. A typical application is in the heat transfer calculations in chemical process plant design. ESDU

N80-20329 Engineering Sciences Data Unit, London (England).
VAPOUR PRESSURES AND CRITICAL POINTS OF LIQUIDS. 14: ALIPHATIC OXYGEN-NITROGEN COMPOUNDS
1979 27 p
(ESDU-79030; ISBN-0-85679-278-0) For information on availability of series, sub-series and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $874.50

Saturated vapor pressures of organic oxygen-nitrogen compounds such as amines, amides, nitro compounds, and alcohols are presented along with the procedures used to derive the vapor pressure values. The data on which the values in the Tables are based are the most reliable available and have been fitted and correlated by equations that are valid from the melting temperature (or triple point where it is known) upwards over the whole liquid range. Tabular values derived from these equations vary from just under 0.01 mmHg to the critical pressure, thus considerably extending the range of values obtainable from Antoine equations available for some of the compounds. This data is useful for the design of process plants such as compressors, distillation columns, heat exchangers, liquefaction plants, and reactors. ESDU

N80-20330 Cornell Univ., Ithaca, N. Y.
ASYMPTOTIC ANALYSIS OF NEAR-STOICHIOMETRIC FLAME PROPAGATION Ph.D. Thesis
Asok Kumar Sen 1979 129 p
Avail: Univ. Microfilms Order No. 8003985

A two reactant model, with general Lewis numbers K and L for oxidant and fuel respectively, was analyzed. It was found that the phenomenon occurs (in the absence of dissociation) whenever K is large enough and L is small enough, the precise conditions always being met in practice. In other words, diffusion alone provides a satisfactory explanation. Dissociation of the combustion products is incorporated into the analysis to show that, while it does explain the shift in the maximum frame temperature, it has only a subsidiary effect on the maximum burning rate. Dissert. Abstr.

N80-20331 Johns Hopkins Univ., Baltimore, Md.
ROLE OF CLUSTER SIZE AND SURFACE ON PHASE TRANSITIONS Ph.D. Thesis
Pazhayannur Krishnan Swaminathan 1980 111 p
Avail: Univ. Microfilms Order No. 8006949

The effect of excluded volume is incorporated into a physical cluster model for the gas-liquid phase transition using the Percus-Yevick approximation for a mixture of spherical clusters to treat the excluded volume. The analytic properties of the model are examined using an expansion in terms of a variable containing the fugacity and the pressure. Scaled particle theory for a mixture of spherocylinders is used to examine the question of phase transition from pure size effect among rod like particles. It is shown that scaled particle theory does not predict such a phase transition. The phase transition behavior of the interacting Dimer model and three other lattice models with anisotropic interaction are examined by analyzing exact series expansions. The properties of the models are related to the nature of clusters the interaction schemes lead to. Dissert. Abstr.

N80-20332 State Univ. of New York, Buffalo.
THE DEVELOPMENT OF AN ELECTROCHEMICAL METHOD FOR THE DETERMINATION OF THE EFFECTIVE VOLUME OF CHARGED POLYMERS IN SOLUTION AND ITS APPLICATION TO CONTINUING STUDIES OF METAL ION BINDING POLYELECTROLYTES Ph.D. Thesis
Peter Slota, Jr. 1979 159 p
Avail: Univ. Microfilms Order No. 8005715

An electrochemical method that is projected for the determination of the effective volume of a colloidally dispersed polyelectrolyte phase in aqueous media was evaluated. Experiments with the highly flexible carboxy methyl dextran gel and the more rigidly cross linked poly methacrylic acid resin were performed. With the well defined gel (resin) phase it was possible to measure the polymer volume as a function of every experimental condition employed to test fully the fundamental concepts developed. Application of this method for estimate of the effective volume of a weakly acidic (basic) polymer in solution was attempted. Metal binding of Cu(2) with the repeating functional units of the soluble polyelectrolytes, poly methacrylic acid and poly glutamic acid, was investigated in two salt media, sodium sulfate and sodium poly styrene sulfonate. Potentiometric measurements were made to facilitate the resolution of species formed as well as their formation constants. Dissert. Abstr.

N80-20333 Maryland Univ., College Park.
TWO-DIMENSIONAL, LAMINAR, MIXED (FORCED AND FREE) CONVECTION, RADIATIVE DIFFUSION FLAMES Ph.D. Thesis
Chun-Nan Liu 1979 195 p
Avail: Univ. Microfilms Order No. 8007097

The two dimensional, mixed mode (forced and free) convection, radiative and laminar diffusion flame over a vertical pyrolyzing fuel slab was investigated. Of particular interests were the variable distributions inside the boundary layer, the wall fluxes along the streamwise direction and the influence of eight parameters on the flame characteristics. Radiative heat transfer of absorbing emitting products, e.g., carbon dioxide, water vapor and soot, was assumed to be dominant only transversely and be negligible streamwisely. Based on this assumption, the boundary layer transport equations can be categorized as the parabolic type and thus were solved using a marching finite difference method. The radiation flux was formulated for the general nongray mixture of gases and soot. The exact and approximate formulas were obtained for numerical calculation. The pseudogray model was devised to reduce the computation time required by the nongray calculation. Dissert. Abstr.

N80-20334* National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD AND MEANS FOR HELIUM/HYDROGEN RATIO MEASUREMENT BY ALPHA SCATTERING Patent
A. Bruce Whitehead (JPL) and Thomas A. Tombrello, inventors (to NASA) (JPL) Issued 18 Mar. 1980 8 p Filed 7 Nov. 1978 Supersedes N79-12416 (17 - 03, p 0329) Sponsored by NASA
(NASA-Case-NPO-14079-1; US-Patent-4,194,115; US-Patent-Appl-SN-958573; US-Patent-Class-250-308; US-Patent-Class-250-307) Avail: US Patent and Trademark Office CSCL 07D

An apparatus for determining helium to hydrogen ratios in a gaseous sample is presented. The sample is bombarded with alpha particles created by a self contained radioactive source and scattering products falling within a predetermined forward scattering angular range impact a detector assembly. Two detectors are mounted in tandem, the first completely blocking the second with respect to incident scattering products. Alpha particle/hydrogen or alpha particle/helium collisions are identified by whether scattering product impacts occur simultaneously in both detectors or only in the first detector. Relative magnitudes of the two pulses can be used to further discriminate against

other effects such as noise and cosmic ray events.
Official Gazette of the U.S. Patent and Trademark Office

N80-20335 Virginia Polytechnic Inst. and State Univ., Blacksburg.
FAST FOURIER TRANSFORM SQUARE WAVE VOLTAMMETRY Ph.D. Thesis
David Payne Binkley 1979 342 p
Avail: Univ. Microfilms Order No. 8005211

Fast Fourier transforms are introduced as a unique digital data handling tool for square wave voltammetry. The technique developed performs the current differencing scheme in the spatial frequency domain over spatial frequencies which are noise free. The technique is verified experimentally with solutions of lead (II) in HCl and thallium (I) in HNO3. A FFT linear parameter estimation analysis is introduced as a digital data manipulation technique for fused peak analytical systems. The algorithm is tested theoretically and experimentally on various ratios of lead (II) to thallium (I) in nitric acid where the peak separation is approximately 70 millivolts. The algorithm performs the calculation over noise free spatial frequencies and significantly reduces the complexity of the calculation relative to the conventional case.
Dissert. Abstr.

N80-20336 Purdue Univ., Lafayette, Ind.
TIME RESOLVED ANALYSIS OF FLUORESCENT METAL CHELATES Ph.D. Thesis
Thomas Lee Craven 1979 131 p
Avail: Univ. Microfilms Order No. 8005850

Salicylidene-o-aminophenol (SoAP) is found to be a suitable ligand for the time resolved fluorescence analysis of group 3A metal ions. Results of studies on SoAP and on ion pair complexes of rhodamine B show that a correlation exists between bond strength and metal to metal fluorescence lifetime variations, and that a heavy atom effect model provides a means for the evaluation of ligands for time resolved fluorescence analysis. A propagation of errors treatment resulted in a more precise evaluation of a chelate system by the heavy atom effect. Precision in the multicomponent analyses was considered, both through guidelines for the determination of the fluorescence lifetime and through a propagation of errors treatment that includes lifetime uncertainties in multicomponent analysis. Two component time resolved analyses of aluminum and gallium via SoAP and three component analyses of group 3A metals were demonstrated. Dissert. Abstr.

N80-20337 Michigan State Univ., East Lansing.
SELECTED ION FRAGMENTATION WITH A TRIPLE QUADRUPOLE MASS SPECTROMETER Ph.D. Thesis
Richard Alan Yost 1979 105 p
Avail: Univ. Microfilms Order No. 8006213

The triple quadrupole system is a simple and efficient implementation of the selected ion fragmentation technique, whereby several ionic species are generated from a sample, ions of a particular mass are selected for fragmentation, and the resulting fragment ions are mass analyzed. The instrument consists of, in series, a dual chemical ionization/electron impact ionization source, a quadrupole mass filter, an RF-only quadrupole that can be pressurized with a collision gas, a second quadrupole mass filter, and an electron multiplier. The ion fragmentation process is performed by collision-induced dissociation, in which the ion acquires internal energy by collision with a neutral molecule. The RF-only quadrupole collision chamber provides focusing of scattered ions. The instrument is described and its performance evaluated. Dissert. Abstr.

N80-20338*# National Aeronautics and Space Administration. Pasadena Office, Calif.
THERMAL REACTOR AND PROCESS Patent Application
Harry Levin, inventor (to NASA) (JPL) Filed 29 Feb. 1980 19 p
(Contract NAS7-100)
(NASA-Case-NPO-14369-1; US-Patent-Appl-SN-126063) Avail: NTIS HC A02/MF A01

A thermal reactor for pyrolytically decomposing silane gas into liquid silicon and hydrogen gas is presented. A water cooled injection probe introduces the silane tangentially into a reaction chamber heated well above the decomposition temperature of silane. An outer downwardly moving vortex containing the liquid silicon and an inner upwardly moving vortex containing hydrogen gas are formed. The liquid silicon deposits into the interior walls of the reaction chamber to form an equilibrium skull layer which flows to the bottom of the reaction chamber where it is removed. The hydrogen gas is removed from the top of the reaction chamber by a vortex finder. NASA

N80-20339*# Polytechnic Inst. of New York. Aerodynamics Lab.
APPLICATION OF RAMAN DIAGNOSTICS TO COMBUSTION Final Report
S. Lederman, C. Posillico, and Anthony Celentano Apr. 1980 22 p refs
(Contract NsG-3108)
(NASA-CR-162901; POLY-M/AE-80-8) Avail: NTIS HC A02/MF A01 CSCL 21B

The use of laser Raman diagnostic techniques to measure the specie concentrations and their temperatures in combustion flow fields is discussed. The system designed to measure the specie concentrations, which included a ruby laser and a photodiode to trip the laser at the maximum light and heat output of the combustion process, is described and problems encountered in developing the system are reported. Photographs of the combustion process are presented and analyzed detailing the evolution of the combustion in terms of the photodiode and the lack of a noticeable Raman-Stokes signal. The absence of the Raman-Stokes signal is discussed. A.W.H.

N80-20340*# Massachusetts Inst. of Tech., Cambridge. Sloan Automotive Lab.
COMBUSTION AND OPERATING CHARACTERISTICS OF SPARK-IGNITION ENGINES Final Report, Jan. 1979 - Jan. 1980
John B. Heywood, James C. Keck, Gian Paolo Beretta, and Paula A. Watts 28 Mar. 1980 13 p refs
(Grant NsG-3245)
(NASA-CR-162896) Avail: NTIS HC A02/MF A01 CSCL 21B

The spark-ignition engine turbulent flame propagation process was investigated. Then, using a spark-ignition engine cycle simulation and combustion model, the impact of turbocharging and heat transfer variations on engine power, efficiency, and NO sub x emissions was examined. R.E.S.

N80-20341# Purdue Univ., Lafayette, Ind. Project SQUID Headquarters.
THE STRUCTURE OF EDDIES IN TURBULENT FLAMES, VOLUME 1
Norman A. Chigier and Andrew J. Yule Mar. 1979 104 p refs Prepared in cooperation with Sheffield Univ., England
(Contract N00014-75-C-1143; Proj. SQUID)
(AD-A078625; SQUID-US-1-PU-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 21/2

High frequency response measurement techniques are used with data processing and conditional sampling to measure large eddy structure and coherence in the transitional flow region of turbulent diffusion flames. Comparisons are made between nonburning and burning flow conditions; these show physical similarity for cold and burning flows in the transitional region. Flow visualization shows quasi-laminar interface layers which are distorted, stretched and convoluted by vortex interactions. High-speed Schlieren color movies show axisymmetric wave and vortex ring formation. Velocity, temperature and ionization density measurements show that the transitional flow and the potential core of the jet are much longer in the flame than in the nonburning jet. A marked difference is found between the initial fundamental instability frequencies of the shear layers; the most amplified frequency predicted by stability theory for cold inviscid flow is found in the cold jet but not the flame. Increase in viscosity due to heat release causes delay and damping of the processes of vortex formation and coalescence; dilatation and buoyancy forces also contribute to differences between the flame and cold jet. Large eddies are shown to play an important role in the transitional region of turbulent jet flames. GRA

N80-20342# Illinois Univ. at Urbana-Champaign. Coordinated Science Lab.
EXTREMAL EFFECTS IN ROTATIONALLY INELASTIC DIFFRACTION Ph.D. Thesis

Lynn Charles Rathbun Mar. 1979 133 p refs
(Contract DAAB07-72-C-0259; Grant NSF DMR-76-82088)
(AD-A077151; UILU-ENG-78-2230; R-840) Avail: NTIS HC A07/MF A01 CSCL 07/4

The scattering of the hydrogenic molecules H2, D2, and HD from vacuum cleaved MgO (001) along the (110) azimuth has been studied. A thermal beam at 300 K and 80 K was used. Particular emphasis has been placed on the rotational inelastic processes which accompany diffraction of HD. Singularities in the scattering amplitude for the rotationally inelastic events have been found to significantly effect the scattered distributions. This effect, extremal scattering, has been explained in terms of a simple mechanism, allowing accurate calculation of the scattering profiles and angles. The scattering of helium along both the (110) and the (100) azimuths has also been studied. Anomalous shifts and structure have been seen in the diffraction lobes for scattering along the (110) azimuth. These are explained in terms of a wavelength dependent transition probability, calculated in the semiclassical approximation. GRA

N80-20343# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
MODELS FOR THE PHOTOELECTROLYTIC DECOMPOSITION OF WATER AT SEMICONDUCTING OXIDE ANODES Interim Report
J. H. Kowalski, K. H. Johnson, and H. L. Tuller 31 Dec. 1979 23 p refs
(Contracts N00014-78-C-0970; N00014-78-C-0366)
(AD-A079469; Rept-10) Avail: NTIS HC A02/MF A01 CSCL 07/4

Surface states at semiconducting TiO2/electrolyte interfaces are believed to play an important role in charge transfer and thereby the efficiency of photoelectrochemical processes at such interfaces. Theoretical calculations were therefore performed using the SCF-Xalpha-SW method to determine the position and character of surface states at various characteristic interfaces. At the TiO2/water interface, antibonding surface states were found which when occupied would explain the experimentally observed dissociation of water into hydroxyl groups at n-type semiconducting TiO2 surfaces. Similarly, antibonding surface states were found at the TiO2/OH interface which when occupied would tend to destabilize the OH bond. A likely mechanism for the dissociation of water and decomposition of certain photoanodes in photoelectrochemical cells based on the above results is presented. The effects of surface reconstruction at heavily reduced TiO2 surfaces on the validity of our calculations are also discussed. GRA

N80-20344# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
MOLECULAR ORBITAL CRITERIA FOR REDUCTIVE ELIMINATION FROM ORGANOTRANSITION-METAL COMPLEXES Interim Report
A. C. Balazs, K. H. Johnson, and G. M. Whitesides Dec. 1979 16 p refs
(Contract N00014-75-C-0970)
(AD-A079447; Rept-9) Avail: NTIS HC A02/MF A01 CSCL 07/4

The following molecular-orbital criteria for bond reforming and reductive elimination from organotransition-metal complexes have been found: (1) The existence of an occupied molecular orbital that is antibonding between the metal (M)site and reactants (H, CH3) and bonding between the reactants (H, CH3); and (2) This orbital should be the highest or nearly highest occupied molecular orbital of the metal-reactant complex for the reaction to occur at low temperature. The difference between the energy of this orbital and that of the highest occupied orbital, if nonzero, is a qualitative indication of the relative facility of the bond reforming activation energy. GRA

N80-20345# Defence Research Establishment Suffield, Ralston (Alberta).
A CHROMATOGRAPH INJECTION VALVE, AN APPARATUS FOR RAPID INSERTION OF MINIATURE GLASS SAMPLERS INTO THE CARRIER GAS FLOW OF A GAS CHROMATOGRAPH
W. J. Fenrick and W. C. Carpenter Dec. 1979 20 p
(AD-A079882; DRES-TN-402) Avail: NTIS HC A02/MF A01 CSCL 07/4

An injection valve for the rapid insertion of miniature glass samplers into the column of a gas chromatograph has been designed and tested. The valve is constructed so that the carrier gas can be allowed to bypass the injection system and flow directly into the column or it can be diverted through a glass sampler tube where it entrains desorbed vapours and carries them into the chromatograph column. Diversion of the carrier gas is so rapid that the operational stability of the gas chromatograph is not affected. A description and general assembly drawing of the unit, together with experimental evidence of its performance, are presented. GRA

N80-20346# Materials Research Labs., Ascot Vale (Australia).
PERFORMANCE OF A GEL PERMEATION CHROMATOGRAPH AND ITS USEFULNESS IN EXAMINING MIXTURES OF ORGANIC MATERIALS
Ivan Grabovac and Carolyn E. M. Morris Jan. 1979 35 p refs
(AD-A079953; MRL-R-725) Avail: NTIS HC A03/MF A01 CSCL 07/4

As part of a programme of assessing the molecular properties of organic materials of defence interest, the performance of a locally designed gel permeation chromatograph fitted with a refractive index (R.I.) detector and an evaporative analyser (E.A.) detector has been examined. It was found that with the R.I. detector the performance is similar to that of other instruments. The response of the E.A. detector was found to depend on a number of operating conditions in an unforeseen manner which limits the usefulness of this detector. However, molecular weight distributions determined with the E.A. detector showed good agreement with the R.I. results. Using the two detectors simultaneously, a study has been made of a complex mixture of epoxy resins (an aircraft adhesive) and it has been shown that information relevant to the performance of advanced organic materials can be provided by such studies. GRA

N80-20347# Naval Research Lab., Washington, D. C. Lab. for Computational Physics.
THEORETICAL AND COMPUTATIONAL APPROACH TO MODELING FLAME IGNITION Interim Report
Elaine S. Oran and Jay P. Boris 18 Dec. 1979 30 p refs
(RR0240241)
(AD-A079306; NRL-MR-4131) Avail: NTIS HC A03/MF A01 CSCL 21/2

In this paper, time-dependent results obtained from a simplified but nonlinear analytic similarity solution and a detailed numerical simulation are used to study the relations between the fundamental processes occurring in the very early stages of flame ignition in homogeneous premixed gases. The parameters which may be varied are the composition of the mixture, the initial radius of energy deposition R sub 0, the duration of the heating TAN SUB 0, and the total energy deposited in the system E sub 0. The similarity solution plus the ignition delay times Tau sub c for the fuel-oxidizer mixture as a function of temperature can be used to calculate whether or not a given energy source is adequate to ignite the system. This simple procedure may then be calibrated using the time-dependent NRL detailed reactive flow models. The models include the thermophysical properties of the mixture, a full chemical kinetics scheme, the nonlinear convection of self-consistent fluid dynamics and the matrix molecular diffusion coefficients for the individual species. Results are presented for a selected mixture of H2-O2-N2 for two values of R sub 0 which show that a model must be constructed for a quench volume in order to complete the similarity solution calibration. GRA

N80-20348# Stanford Univ., Calif. Dept. of Mechanical Engineering.
DEVELOPMENT OF COMBUSTION DIAGNOSTICS AND APPLICATIONS TO TURBULENT COMBUSTION Interim Scientific Report, 16 Feb. - 30 Sep. 1979
R. K. Hanson and C. T. Bowman 1979 16 p refs
(Contract F49620-78-C-0026; AF Proj. 2308)
(AD-A079523; AFOSR-79-1320TR) Avail: NTIS HC A02/MF A01 CSCL 21/2

Measurements with a tunable diode laser absorption system have been conducted in steady, fluctuating and sooting atmospher-

ic-pressure flames produced in either a flat flame or a slot burner. Parameters measured include temperature, CO species concentration and CO spectroscopic parameters (line strengths and collision half widths). The measurements involve rapidly scanning the narrow-linewidth diode laser across individual vibration-rotation lines in the fundamental band of CO at 4.6 microns to record fully-resolved absorption line profiles in times as short as 100 microseconds. A conventional microprobe sampling system has been used to monitor CO and CO2 concentrations to enable comparisons between laser-based and conventional probe-based measurements; thermocouples have been used to allow comparisons with laser-based temperature measurements. Results in fuel-rich flames show good agreement between the laser-based and probe-based measurements. Work is in progress to extend the measurements to fuel lean stoichiometries. Work has progressed on assembly and checkout of a new facility for studies of the dynamics of fluctuating or turbulent combustion flows. The facility generates a two-dimensional shear flow which will be used to study the coupling between fluid dynamic and chemical processes in a turbulent mixing layer. GRA

N80-20348# General Electric Co., Philadelphia, Pa. Reentry and Environmental Systems Div.

PROCESSING RESEARCH ON CHEMICALLY VAPOR DEPOSITED SILICON NITRIDE Progress Report, 1 Feb. 1978 - 1 Oct. 1979

R. A. Tanzilli, J. J. Gebhardt, J. Dandrea, C. Dulka, and J. Hanson Dec. 1979 187 p refs

(Contract N00014-78-C-0107)

(AD-A079328; Rept-79SDR2324) Avail: NTIS HC A09/MF A01 CSCL 13/8

Processing research during this contract phase has explored the deposition kinetics of silicon nitride with a variety of furnace designs and silicon:nitrogen precursors including variations in the usual thermodynamic variables of pressure, temperature, flow rate and reactant concentrations. Two specific processes have been identified for forming flat plate and figured geometries in a 'hot-wall' reactor. In addition, a set of process conditions have been identified for forming flat plate material of comparable physical properties in a 'cold-wall' reactor at significantly higher deposition rates. GRA

N80-20350# Florida Univ., Gainesville. Dept. of Chemistry.

ATOMIC AND MOLECULAR GAS PHASE SPECTROMETRY Final Scientific Report, 1 Sep. 1975 - 30 Sep. 1979

James D. Winefordner 1979 46 p refs

(Contract F44620-76-C-0005; AF Proj. 2303)

(AD-A079657; AFOSR-79-1315TR) Avail: NTIS HC A03/MF A01 CSCL 21/2

The research is divided into combustion diagnostics and analytical gas phase atomic and molecular spectrometry. New and improved techniques to spatially and temporally measure flame gas temperatures and species have been and are being developed. These techniques are all based upon fluorescence detection. By measuring the ratio of two fluorescence transitions (in a probe, such as indium) excited with two different wavelengths, the flame temperature can be measured with a precision and accuracy better than 50 K. The two main temperature techniques developed depend upon either the linear relationship between fluorescence and the excitation flux on the approach to saturation of the fluorescence with high excitation fluxes. The measurement of total species concentrations in flames and fluorescence quantum efficiencies is readily performed by measurement of the absolute fluorescence flux reaching a calibrated detector as a function of absolute laser flux. A rather simple graphical method allows both species concentration and species fluorescence quantum efficiencies to be measured. GRA

N80-20351# University of South Florida, Tampa. Coll. of Engineering.

COMBUSTION OF METHANOL COAL SLURRIES IN HARTMANN RESONATOR Final Report, 15 Aug. 1977 - 15 Mar. 1979

S. C. Kranc Mar. 1979 31 p refs

(Grant EF-77-G-01-2744)

(FE-2744-T2) Avail: NTIS HC A03/MF A01

A series of experiments were conducted to determine the combustion characteristics of mixtures of finely pulverized coal suspended in methanol. Such mixtures could be attractive alternate fuels since the advantages of methanol combustion are retained while raising the heating value on a mass basis. A second major aspect of this study was concerned with the development and application of the Hartmann atomizer to deliver the fuel. This is an air atomizer which produces intense gas pulsations that help to disrupt and disperse the fuel. Fuel mixtures using several coal types were tested. The fuels were burned in the wake of a disk baffle incorporating the atomizer and located in a water jacketed flame tube. Measurements of heat deposited in the water jacket and exhaust gas were made. Analysis of the data indicates that the coal suspension compare favorably to pure methanol under test conditions. DOE

N80-20352# Princeton Univ., N. J.

DETAILED MODELING OF DIESEL COMBUSTION

F. V. Bracco 1979 19 p refs Presented at DOT-TSC Conf. on Transportation Diesel Engine Fuel Economy Optimization, Cambridge, Mass., Sep. 1977

(Contract EC-77-S-02-4191)

(CONF-7709196-1) Avail: NTIS HC A02/MF A01

Combustion modeling techniques are considered that are approaching the point of being applicable to diesel engines. Combustion of a quiescent premixed charge in a constant volume bomb is studied. Progressively more complex charge and geometry configuration are then considered that are more and more relevant to diesel engine combustions. DOE

N80-20353# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.

CHEMICAL KINETIC MODELING FOR COMBUSTION APPLICATIONS

F. L. Dryer and C. K. Westbrook Sep. 1979 45 p refs Presented at AGARD Propulsion and Energetics Panel Specialists Meeting on Combustion Modelling, Cologne, 27 Sep. 1979 Prepared in cooperation with Lawrence Livermore Lab., Calif.

(Contract W-7405-eng-48)

(UCRL-81777; CONF-790952-1) Avail: NTIS HC A03/MF A01

The construction of detailed reaction mechanisms for the oxidation of typical hydrocarbon fuels, and the validation of these mechanisms through careful comparison between computed and experimental data are discussed. The derivation and validation of appropriate simplified reaction schemes for practical fuels are presented. The techniques involved in the development of both types of models are described and the results produced by each model are compared. DOE

N80-20354# California Univ., Berkeley. Lawrence Berkeley Lab.

TIME RESOLVED SPECTROSCOPY USING SYNCHROTRON RADIATION Ph.D. Thesis

E. D. Poliakoff Aug. 1979 112 p refs

(Contract W-7405-eng-48)

(LBL-9475) Avail: NTIS HC A06/MF A01

The use of synchrotron radiation for spectroscopic studies of the dynamic processes occurring in gas phase systems is discussed. A number of synchrotron radiation experiments are described with the majority concerned with the time dependent radiative decay of excited states following pulsed photon excitation. The properties of synchrotron radiation are reviewed and radiative fluorescent decay is discussed. Atomic lifetime measurements are reported and fragment radiative lifetimes following photodissociation are examined. Polarization of fragment fluorescence, to determine excited state electronic symmetry of dissociative surfaces, is described and fast fluorescence timing measurements to determine the excited state lifetimes of Kr and Xe are discussed. A.W.H.

N80-20355# Georgia Inst. of Tech., Atlanta. School of Nuclear Engineering.

DEVELOPMENT AND APPLICATION OF THE ELECTRO-CHEMICAL ETCHING TECHNIQUE Annual Progress Report

Aug. 1979 57 p refs

(Contract EY-76-S-05-4814)

(ORO-4814-T1) Avail: NTIS HC A04/MF A01

Advances in the development and application of the electrochemical etching technique for thermal and epithermal neutron dosimetry as well as track geometry determinations are discussed. The bulk and track etching rates were studied by evaluating the track geometry during electrochemical etching. The foil surface removed versus etching time for two different etchants at 1000 V, 2 kHz, and 22 C were studied. Results indicated that the bulk etching rates were constant for the two etchants. The track etching rate (as contrasted with the bulk etching rate) is determined by the microscope focus at various depths. The increase of track depth values as a function of etching time for the two etchants are plotted. The track cone angles were determined and found to be much larger for electrochemically etched polycarbonate foils than for most plastics etched with passive chemical techniques. DOE

N80-20356# Geological Survey, Lakewood, Colo. Water Resources Div.
DETERMINATION OF SELECTED ANIONS IN WATER BY ION CHROMATOGRAPHY Final Report, Mar. 1978 - Jun. 1979
Marvin J. Fishman and Grace Pyen Sep. 1979 37 p refs
(PB80-111941; USGS/WRI-79-101; USGS/WRD/WRI-79/083) Avail: NTIS HC A03/MF A01 CSCL 07D

Ion chromatography was used to determine the major anions in rain water and surface waters. Simultaneous analyses of a single sample for bromide, chloride, fluoride, nitrate, nitrite, orthophosphate, and sulfate are discussed. Chloride, nitrate, nitrite, orthophosphate, and sulfate, in several samples, were determined independently by automated calorimetric procedures. An automated ion selective electrode method used to determine fluoride is described. The results were compared. GRA

N80-20357# Universal Oil Products Co., San Diego, Calif. Fluid Systems Div.
RESEARCH AND DEVELOPMENT ON A SPIRAL-WOUND MEMBRANE SYSTEM FOR SINGLE-STAGE SEAWATER DESALINATION Final Report
R. L. Riley and C. E. Milstead 31 Oct. 1979 298 p refs
(Contract DI-14-34-0001-7543)
(PB80-114705; WB0-01252; OWRT-S-0098(7543)(1)) Avail: NTIS HC A13/MF A01 CSCL 07D

The development of a spiral wound membrane system which approaches theoretical semipermeability and is sufficiently thin to provide transport of water at practical operating pressures and recovery rates for the single stage desalinization of sea water is reported. The thin film composite membranes are based on nitrogen containing polymers supported on a fabric reinforced porous supporting membrane. Tests on the membrane elements are described which determined the stability of the elements as functions of feed temperature, water recovery, dissolved oxygen, and cleaning techniques. Experience with the design, construction, installation, and operation of a reverse osmosis system which utilizes the spiral wound membrane elements is discussed. A.W.H.

N80-20358# TRW Space Technology Labs., Redondo Beach, Calif.
EVALUATION OF SENSITIZED FLUORESCENCE FOR POLYNUCLEAR AROMATIC HYDROCARBON DETECTION Final Report, Jan. - Jun. 1979
T. R. Smith Aug. 1979 47 p ref
(Contract EPA-68-02-2689)
(PB80-108475; EPA-600/7-79-207) Avail: NTIS HC A03/MF A01 CSCL 07D

An evaluation of a fluorescent spot test for detecting the presence of polynuclear aromatic hydrocarbons (PAHs) as a screening technique for samples to be analyzed by gas chromatography/mass spectrometry (GC/MS) is discussed. The test is based on the phenomenon of sensitized fluorescence and is capable of easily detecting 100 picograms of PAH in a microliter sample, a level of sensitivity adequate for screening combustion effluent samples. Two interferences were observed: highly colored samples require dilution to allow viewing of the fluorescence level, and samples containing substantial amounts of phthalate esters produce false positive results. GRA

N80-20359# Bureau of Mines, Washington, D. C. Div. of Nonmetallic Materials.
PERLITE: MINERAL COMMODITY PROFILES
Arthur C. Meisinger Aug. 1979 20 p refs
(PB80-111362) Avail: NTIS HC A02/MF A01 CSCL 08I

A glossy volcanic rock, perlite expands to about 20 times its original volume when heated to an appropriate temperature within its softening range. The resultant expanded product finds a variety of industrial and constructional applications owing to the material's low density with attendant properties of low thermal conductivity and high sound absorption. The United States is the world's principal producer and consumer of perlite. Industry structure, uses, reserves-resources, technology, supply-demand relationships, economic factors, and problems, operating factors and problems, and outlook to 2000 are discussed. GRA

N80-20360# Tennessee Valley Authority, Muscle Shoals, Ala. Air Quality Research Section.
DESIGN OF PHOTOCHEMICAL REACTION CHAMBER
L. Stockburger, III and J. F. Meagher Jul. 1979 39 p refs
(PB80-100654; TVA/ONR-79/02) Avail: NTIS HC A03/MF A01 CSCL 14B

A 1100 cu ft Teflon photochemical reaction chamber was constructed to study chemical reactions that occur in dilute coal fired power plant plumes. The design and characterization of the chamber are discussed. The experiments which are to be conducted under controlled conditions to study the gaseous and gas particulate reactions using actual flue gas under solar or simulated solar conditions are described. A.W.H.

N80-20361# Bureau of Mines, Washington, D. C.
BISMUTH: MINERAL COMMODITY PROFILES, AUGUST 1979
James F. Carlin Aug. 1979 17 p refs
(PB80-111438) Avail: NTIS HC A02/MF A01 CSCL 08I

Bismuth metal, produced primarily as a byproduct from the ores of other metals, principally copper and lead, is examined. The industry structure, uses, reserves-resources, technology, supply-demand relationships, byproducts and coproducts, strategic considerations, economic factors and problems, operation factors and problems, and outlook to the year 2000 for bismuth are topics addressed. GRA

N80-20362# Bureau of Mines, Washington, D. C.
CADMIUM
John M. Lucas Aug. 1979 20 p refs
(PB80-111420) Avail: NTIS HC A02/MF A01 CSCL 08I

Comprehensive data on cadmium are presented. Included are the following: industry structure; uses; reserves-resources; technology; supply-demand relationships; strategic considerations; economic factors and problems, environmental considerations (toxicity); operating factors and problems; and outlook to 2000. GRA

N80-20363# Clark Coll., Atlanta, Ga. Dept. of Physics.
VAPOR PRESSURE AND MELTING BEHAVIOR OF SULFURIC ACID-WATER SYSTEMS Final Report, Nov. 1974 - Aug. 1977
G. Raymond Brown and V. Rao Veluri Aug. 1979 30 p refs
(Grant EPA-R-804470)
(PB80-116007; EPA-600/3-79-077) Avail: NTIS HC A03/MF A01 CSCL 14B

Apparatus was designed and constructed to use high vacuum and mass spectrometric techniques to determine total and partial vapor pressures above bulk liquid samples in the temperature range between -65 C and 25 C. Observations on the sulfuric acid-water system revealed complexities which interfered with the experimental goal, but which are of some interest in themselves. These interfering processes included long internal thermal relaxation times and chemical reactions. A pressure effect was observed on the melting curve of the sulfuric acid-water mixtures. GRA

N80-20364# National Bureau of Standards, Washington, D.C. National Engineering Lab.
PURELY BUOYANT DIFFUSION FLAMES: SOME EXPERIMENTAL RESULTS Final Report
Bernard J. McCaffrey Oct. 1979 52 p refs

(PB80-112113; NBSIR-79-1910) Avail: NTIS HC A04/MF A01 CSCL 21B

Measurements of temperature and velocity using thermocouples and an impact probe were made in the near field of a purely buoyant diffusion flame produced by a porous refractory burner. Based on the time averaged center line value of V and delta T together with photographic records the flame was divided into three distinct regimes: (1) a continuous flame region, starting from the surface of the burner with Y equal to zero at the surface and rising with the height above the burner, Z to the 1/2 power, delta T is constant over this regime. Higher up is (2), an intermittent regime, with pulsating flame exhibiting approximately constant V and delta T tailing with z to the first power. Still higher is (3), the plume region which is most of the time, free of flames as predicted by conventional plume theory. Throughout the three regimes and indistinguishable among these was the consistency of the buoyancy relation. GRA

N80-20365# National Bureau of Standards, Boulder, Colo. National Engineering Lab.

NORMAL BUTANE: PROVISIONAL THERMODYNAMIC FUNCTIONS FROM 135 TO 700 K AT PRESSURES TO 700 BAR

Robert D. Goodwin Washington, D.C. Dept. of Commerce Sep. 1979 172 p refs Sponsored in part by Gas Research Inst.

(PB80-118193; NBSIR-79-1621) Avail: NTIS HC A08/MF A01 CSCL 07D

Thermophysical properties of n-butane are tabulated at integral temperatures along isobars over the entire range of fluid states. Results for the compressed liquid, from the triple to the boiling point, were estimated using the highly constrained, nonanalytic equation of state, because experimental P-rho-T data are lacking in this region. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N80-20366 British Library Lending Div., Boston Spa (England).

TESTING THE CORROSION PROTECTION PROPERTIES OF COATINGS BY MEANS OF PULSED DIRECT CURRENT

E. Babel Oct. 1979 19 p refs Transl. into ENGLISH from Plaste und Kautschuk (East Germany), v. 18, no. 12, 1971 p 931-935

(BLL-RTS-11872) Avail: British Library Lending Div., Boston Spa, England

Lacquered test pieces were connected as anodes in a measurement cell containing pure aerated water with a counter-electrode and were subjected to a low dc voltage with a low pulse frequency. The alternation between interruptions in the current and current impulses in the presence of water and atmospheric oxygen produced a concentrated stress equivalent to years of weathering. Resistance-time curves were determined from changes in the current flow, yielding information on the mechanism of corrosion and allowing conclusions to be drawn about the corrosion properties of protective systems on the basis of their specific overall resistance. Information on deficiencies in formulation can be obtained from the nature, size and number of blisters formed and the corrosion products produced. Blister formation also provides information on the watertightness of the protective film. If coatings are applied without defects then the measured results are largely independent of subjective assessments. A.R.H.

N80-20367 Missouri Univ. - Columbia.

APPLICATION OF INELASTIC ELECTRON TUNNELING SPECTROSCOPY TO THE STUDY OF INHIBITION OF ALUMINUM CORROSION Ph.D. Thesis

Recai Mehmet Ellialtioughu 1979 113 p

Avail: Univ. Microfilms Order No. 8007146

Inelastic electron tunneling spectra contained peaks associated with all of the intermediate and final products which have been suggested in the free radical mechanism for corrosion of aluminum in CCl4. The inhibitor molecule, formamide, in CCl4 solution was found to preferentially adsorb on the aluminum oxide surface, suggesting that the inhibition mechanism is surface passivation rather than alteration of the corrosive medium. From the spectra of formamide and its deuterated derivatitives information was obtained on the identity of the adsorbed surface reacted specie, its orientation with respect to the oxide surface, the types of active sites involved, and the nature of the bonding between the oxide and the adsorbate. A model for the mechanism of inhibition by formamide is suggested. Dissert. Abstr.

N80-20368 Stanford Univ., Calif.

SUBGRAIN REFINEMENT STRENGTHENING IN STAINLESS STEEL ALLOYS Ph.D. Thesis

Rodney Henry Klundt 1979 265 p

Avail: Univ. Microfilms Order No. 8006320

The influence of subgrains on the elevated temperature deformation behavior of E-Brite 26-1, HT-9, DTO2 and Type 304 stainless steel was investigated. Tests were performed in both compression and torsion. The torsion tests allowed very large strains to be achieved under constant strain rate conditions. Each torsion sample was quenched under load when the test was completed to capture the substructure present during deformation. The quenched structures were evaluated by transmission electron microscopy to correlate the substructural characteristics with the test parameters. Strain-rate-change tests were conducted in compression to determine the degree of strengthening that could be achieved through subgrain refinement. Results are examined for each alloy. Dissert. Abstr.

N80-20369 Stanford Univ., Calif.

LARGE-STRAIN DEFORMATION OF A MILD STEEL AT INTERMEDIATE TEMPERATURES Ph.D. Thesis

David Lee Bourell 1979 250 p

Avail: Univ. Microfilms Order No. 8006293

Commercial grade, 1020 steel was warm rolled below the A1 transformation temperature in a multistep process. A substructure was developed by warm rolling, as evidenced by fine subgrains with high dislocation densities. The subgrain size was independent of warm-working strain, and increased with an increase in warm-working temperature. The room-temperature tensile properties were affected by warm working. The impact behavior is influenced by the crystallographic alignment of weak, cleavage planes in the rolling plane. A qualitative model is used to explain the appearance of cleavage separations, their absence at ambient test temperatures, and the propagation of the main crack in a ductile manner at test temperatures as low as -90 C. Tension testing of warm-worked steels at elevated temperatures revealed that steady-state plastic flow was not attained until strains of about 0.3. Prior warm working appears to have little effect on steady-state plastic flow. Dissert. Abstr.

N80-20370*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

AN EXPERIMENTAL, LOW-COST, SILICON-ALUMINIDE HIGH-TEMPERATURE COATING FOR SUPERALLOYS

Stanley G. Young and Daniel L. Deadmore 1980 16 p refs To be presented at the Intern. Conf. on Metal Coatings, San Diego, Calif., 21-25 Apr. 1980; sponsored by the Am. Vacuum Soc.

(NASA-TM-81455; E-385) Avail: NTIS HC A02/MF A01 CSCL 11F

An evaluation of a duplex silicon-slurry/aluminide coating is presented. The coating is cyclically tested in Mach 1 combustion gases for oxidation and thermal fatigue resistance at 1093 C and in Mach 0.3 gases for hot-corrosion resistance at 900 C. The base metal superalloys are ViA and B-1900. The coated B-1900 specimens performed much better in oxidation than similar specimens coated with aluminides and almost as well as the more expensive Pt-Al and MCrAlY (where M is Ni and/or Co) coatings deposited by the physical vapor deposition process. The coating also provided good hot corrosion protection. Metallographic, X-ray, and electron microprobe studies are used to characterize the coating, determine failure mechanisms, and study some of the changes due to exposure. M.G.

N80-20371# Army Materials and Mechanics Research Center, Watertown, Mass. Polymer Research Div.

RELIABILITY OF ENERGY DISPERSIVE X-RAY FLUORES-

CENCE ANALYSIS OF LOW-ALLOY STEELS
Bernard H. Strauss and Frederick P. Valente Jun. 1979 25 p Presented at Denver X-ray Conf., Denver, 1977
(AD-A077154; AMMRC-TR-79-35) Avail: NTIS HC A02/MF A01 CSCL 11/6

The reliability of energy dispersive X-ray fluorescence data for the analysis of low-alloy steels is reported for chromium, manganese, nickel, and molybdenum. The accuracy and precision of the analysis were evaluated for two mathematical models, linear and multiple regression, using twelve NBS standard reference samples. GRA

N80-20372# Rutgers - The State Univ., Piscataway, N. J. Dept. of Mechanics and Materials Science.
X-RAY ANALYSIS OF ACCRUED DAMAGE IN STRESS CORROSION AND CORROSION FATIGUE Interim Technical Report, 1 Dec. 1978 - 30 Nov. 1979
S. Weissmann, R. Yazici, T. Takemoto, T. Tsakalakos, and I. R. Kramer Dec. 1979 30 p refs
(Contract N00014-77-C-0191)
(AD-A078511; ONR-R-2) Avail: NTIS HC A03/MF A01 CSCL 11/6

The defect structure induced in 304 austenitic stainless steel by stress corrosion and in Al 2024 by corrosion fatigue was studied by X-ray rocking curve measurements of the grains and by X-ray Fourier analysis of the line profiles. The surface layer and bulk of the specimens were investigated, and a critical line width parameter corresponding to a critical excess dislocation density was determined that controlled the integrity of the microstructure. Improvements in the speed and efficiency of data collection were made by instrument automation and application of position-sensitive detectors. GRA

N80-20373# Sandia Labs., Livermore, Calif. Materials Development Div.
CORROSION RESISTANCE OF ZINC-LEVEL PLATED U-0.75 Ti
J. W. Dini and H. R. Johnson Sep. 1979 21 p refs
(Contract DE-AC04-76DP-00789; MIPR-T-311-1005)
(AD-A075539; SAND-79-8041) Avail: NTIS HC A02/MF A01 CSCL 11/6

As part of a program for the U.S. Army directed at improving the corrosion performance of U-0.75 Ti, specimens were coated with Zn-10 Ni alloy electroplate and then subjected to various corrosion tests. This work revealed that the Zn-Ni coatings provided good protection for U-0.75 Ti in salt fog and in non-sealed moist-nitrogen systems. In sealed, moist-nitrogen environments the Zn-Ni coatings deteriorated quickly and provided no protection. Some plating with Zn alone, using some of the new non-cyanide plating solutions, was also attempted, but the results were inconsistent. GRA

N80-20374# Franklin Inst. Research Labs., Philadelphia, Pa.
STRESS CORROSION ENVIRONMENTAL EFFECTS ON AF 1410 Final Report, 1 May 1977 - 30 Apr. 1979
Victor V. Damiano 1979 82 p refs
(Grant AF-AFOSR-3341-77; AF Proj. 2307)
(AD-A078598; FIRL-F-C4708-01; AFOSR-79-1288TR) Avail: NTIS HC A05/MF A01 CSCL 13/8

AF 1410 plates available from Universal Cyclops through Air Force Materials Laboratory under contract F33615-73-C-5093 were welded using filler wire fabricated from sheet stock of the same composition as the base plate and from 1/16 inch Dia. weld wire prepared by Universal Cyclop from AF 1410 stock. The method of welding was cold wire-gas tungsten arc using manual feed. Satisfactory welds having mechanical properties as welded approaching the properties of the base plate in the double austenitized and aged condition were obtained. SCC tests demonstrated that nonhomogeneous microstructures in the fusion zone may result in nonuniform crack extension and seriously affect estimates made of the threshold level of stress intensity. GRA

N80-20375# Air Force Materials Lab., Wright-Patterson AFB, Ohio. Mechanics and Surface Interactions Branch.
ISS/SIMS CHARACTERIZATION OF UV/O SUB 3 CLEANED SURFACES Final Report, Jul. 1978 - Aug. 1979
W. L. Baun Oct. 1979 24 p refs
(AD-A078425; AFML-TR-79-4136) Avail: NTIS HC A02/MF A01 CSCL 13/8

When solids are irradiated with ultraviolet light from a low pressure mercury discharge tube (UV/03), a complex reaction involving interaction of both photons and ozone produces a cleaning action on the surface. In this work, the efficiency of the UV/03 method is evaluated using ISS and SIMS. The UV/03 method is found to be useful for both surface cleaning and storage following cleaning by conventional techniques. GRA

N80-20376# TRW, Inc., Cleveland, Ohio.
CHARACTERIZATION OF CASTING DEFECTS IN TYPICAL CASTINGS OF A DIRECTIONALLY SOLIDIFIED SUPERALLOY Final Report, Oct. 1978 - Dec. 1978
J. M. Marder and C. S. Kortovich Aug. 1979 134 p refs
(Contract F33615-78-C-5373; AF Proj. 7351)
(AD-A077270; AFML-TR-79-4060) Avail: NTIS HC A07/MF A01 CSCL 13/8

A program was conducted to assess the effects of casting defects in directionally solidified (DS) material. The technical approach involved two tasks, the first including the characterization of typical casting defects in F-100 1st and 2nd stage PWA-1422 production turbine blades and the second including the evaluation of thin sheet test specimens cast deliberately to contain defects. The defects included microshrinkage, inclusions and grain misorientation and represented a range of severity levels including conditions exceeding current production acceptance criteria. The analysis of production castings indicated that substantial decreases in the rejection rate could be achieved with only minor relaxation of the acceptability criteria. In addition, dross inclusions were found to be the single most frequent cause for casting rejections. GRA

N80-20377# Sandia Labs., Livermore, Calif. Materials Development Div.
INFLUENCE OF PURITY LEVEL ON THE MECHANICAL PROPERTIES OF HOT ISOSTATICALLY PRESSED BERYLLIUM
Ben C. Odegard, Jr. Sep. 1979 18 p refs
(Contract EY-76-C-04-0789)
(SAND-79-8232) Avail: NTIS HC A02/MF A01

The procurement of a quantity of ultra-pure beryllium powder combined with special handling from powder to billet form resulted in the fabrication of high purity beryllium. The mechanical properties of these billets were contrasted to those of commercial grade billets to determine the influence of impurities and powder processing. The tensile test results show that the strength values are primarily dependent on the grain size in a behavior predictable by the Hall-Petch relationship. Only a fraction of the strength differential can be attributed to metallic impurities in solution. The grain size is controlled by the powder size distribution. The ductility is dominated by both grain size and oxide content. The fine grained, low oxide billets exhibited the highest ductilities. There is evidence to suggest that oxide distribution has a large influence on the ductility. The fracture toughness was highest for the high purity beryllium billets. DOE

N80-20378# Brookhaven National Lab., Upton, N. Y.
DEVELOPMENT OF A PROCEDURE FOR ESTIMATING THE HIGH CYCLE FATIQUE STRENGTH OF SOME HIGH TEMPERATURE STRUCTURAL ALLOYS
P. Soo and J. G. Y. Chow 1979 21 p refs Presented at the ASME Winter Annual Meeting, New York, N.Y., 2 Dec. 1979
(Contract EY-76-C-02-0016)
(BNL-NUREG-26085; CONF-791205-5) Avail: NTIS HC A02/MF A01

An evaluation made of the a test procedure involving a fast cycling rate was (40 Hz) and load controlled conditions. The validity of this procedure for extending current fatigue curves from 10 to the fifth power to 10 to the eighth power cycles and beyond, hinges upon the selection of an appropriate effective strain value, since the strain usually changes rapidly during the early stage of fatigue. Results from annealed 2 1/4 Cr-1 MO, type 304 stainless steel, Incoloy 800H and Hastelloy X, tested over a wide range of temperatures, show that the strain measured N/sub 1/2 is a reasonable estimate since it gives an excellent correlation between the strain and load controled test in the 10 to the fifth power cycle range where the data overlap. It is

shown that the differences in cycling rate and early stress-strain history for the two tests do not significantly affect the correlation. It may, therefore, be concluded that such load control test procedures may be used as a valid fast way for extending currently available fatigue curves from 10 cycles, and currently available fatigue curves from 10 to the fifth power and 10 to the eighth power and beyond. DOE

N80-20379# Brown Univ., Providence, R. I. Div. of Engineering.
CORRELATIONS BETWEEN FRACTURE TOUGHNESS AND MICROSTRUCTURE IN 4140 STEEL. MRL E-113 M.S. Thesis
Trond K. Odegaard Jun. 1979 88 p refs
(Contract EY-76-S-02-3084)
(COO-3084-67) Avail: NTIS HC A05/MF A01

Correlations between the microstructure of an ultra high strength steel and material resistance to fracture, as measured by blunt notch Charpy impact tests and sharp crack K/sub IC/tests, were investigated for a standard 870 C/oil and an experimental 1175 C/oil austenitizing treatment. The increase in sharp crack toughness with higher temperature austenitizing treatments, for the as-quenched and 200 C/oil temper conditions, was rationalized by a fracture criterion based on the notion that for fracture to occur, a critical strain, epsilon/sub f/, must be achieved over some critical distance, delta. The lath colonies were identified as the fracture controlling microstructural unit, and hence, their size was considered to be the critical distance, delta. Fracture toughness differences between the 870 C and 1175 C austenitizing treatments were qualitatively rationalized by the nature of the respective fracture morphologies. Good correspondence between J/sub IC/ and the so-called tearing modulus, T, as indicators of sharp crack fracture toughness, was observed. DOE

N80-20380# Drexel Univ., Philadelphia, Pa. Dept. of Materials Engineering.
STRAIN HARDENING OF IRON, AXISYMMETRIC VS PLANE STRAIN ELONGATION
A. Razavi and G. Langford 1979 7 p refs Presented at the Intern. Conf. on the Strength of Metals and Alloys, Aachen, West Germany, Aug. 1979
(Contract EY-76-S-02-4072)
(CONF-790801-5) Avail: NTIS HC A02/MF A01

The flow stress of titanium gettered ferritic iron at high strains is measured for various shape changes including axisymmetric elongation and compression and plane strain elongation, both by symmetrical strip drawing and also by asymmetrical pure shear. The flow stress is evaluated after a complex deformation (such as chip cutting) by simple mechanical tests on portions of the macroscopic specimen. The flow stress and the microstructures are sensitive to the shape change employed. Comparative microstructures are shown in the various shape changes. The rate of strain hardening of body centered cubic iron appears to be sensitive to the deformation mode at high strains because of the different microstructures which may be related to the different crystallographic preferred orientations. It is shown that the internal shape change is not necessarily simply related to the external shape change. DOE

N80-20381# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
NICKEL CONTAMINATED TITANIUM WELD WIRE STUDY
G. R. Coffin and R. L. Sumstine 18 Jul. 1979 20 p
(Contract EY-76-C-07-1570)
(LTR-141-93) Avail: NTIS HC A02/MF A01

Titanium weld wire used to laser weld thermocouples to fuel rods was tested. It was found that the titanium filler wire was contaminated with nickel which was jacketed on the wire prior to the drawing process. A method was developed to inspect all filler wire for welding application. This method not only indicates the presence of nickel contamination but indicates quantity of contamination. The process is capable of the high speed inspection necessary for various high speed manufacturing processes. DOE

N80-20382# Aluminum Co. of America, Alcoa Center, Pa.
PRODUCTION OF ALUMINUM-SILICON ALLOY AND FERROSILICON AND COMMERCIAL PURITY ALUMINUM BY THE DIRECT REDUCTION PROCESS, PHASE B Interim Technical Report, 1 Mar. - 31 May 1979
Marshall J. Bruno Jun. 1979 22 p refs
(Contract EC-77-C-01-5089)
(CONS/5089-7; ITR-3) Avail: NTIS HC A02/MF A01

The effect of volatile sweep rate on bridge formation and product yield was determined. Higher volatile rates resulted in decreased yields and wider zones of condensation in the shaft. Attempts to charge ores and reduction carbon separately produced very low yields of metallic alloy. Remelt tests of reactor alloy products required temperatures of 1900 C for samples high in Ti. Low Ti-containing alloys melted at 1300 C. Operation of the O2 injected, side entry bench reactor was erratic and inconsistent due to formation of chemical burden bridging. Ferrosilicon alloy products containing 2 to 14% Al were made. Tendency for burden bridging was reduced. Cold modeling studies and compressive strength and abrasion resistance tests results are examined as well as those from fractional crystallization and remelt experiments. DOE

N80-20383# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
COMPUTER SIMULATION OF THE MARTENSITE TRANSFORMATION IN A MODEL TWO-DIMENSIONAL BODY
Sheree Chen, A. G. Khachaturyan, and J. W. Morris, Jr. Jun. 1979 7 p refs Presented at the Intern. Conf. on Martensite Transformations, Boston, 24-29 Jun. 1979
(Contract W-7405-eng-48)
(LBL-9346; CONF-7906103-1) Avail: NTIS HC A02/MF A01

An analytical model of a martensitic transformation in an idealized body is constructed and used to carry out a computer simulation of the transformation in a pseudo two dimensional crystal. The reaction is assumed to proceed through the sequential transformation of elementary volumes (elementary martensitic particles) via the Bain strain. The elastic interaction between these volumes is computed and the transformation path chosen so as to minimize the total free energy. The model transformation shows interesting qualitative correspondencies with the known features of martensitic transformations in typical solids. DOE

N80-20384# Du Pont de Nemours (E. I.) and Co., Aiken, S. C.
EFFECT OF HEAT TREATMENT ON FRACTURE OF TYPE 304L STAINLESS STEEL IN A HYDROGEN ENVIRONMENT
G. R. Caskey, Jr. and J. A. Donovan 1979 19 p Presented at the TMS-AIME Fall Meeting, Milwaukee, 16-20 Sep. 1979
(Contract EY-76-C-09-0001)
(DP-MS-79-18; CONF-790910-3) Avail: NTIS HC A02/MF A01

Thermal treatments significantly effect the mechanical behavior of Type 304L stainless steel tested in a high-pressure (69 MPa) hydrogen environment. A grain size increase from 10 to 350 micron m increased susceptibility to hydrogen damage and accentuated changes in fracture morphology. The Hall-Petch relation for yield strength was the same for tests in both hydrogen and helium environments. Sensitization increased ductility loss in hydrogen but did not change the fracture mode of smooth bar tensile specimens. Variation in quench rate from 0.25 to 50 K/sec had only a minor influence on susceptibility of hydrogen embrittlement. The absence of an abrupt load drop at fracture and change in fracture morphology for tests in high pressure hydrogen indicate that fracture initiated at or near the surface and rapidly propagated inward. DOE

N80-20385# Illinois Univ., Urbana. Graduate Coll.
ANALYTICAL ELECTRON MICROSCOPE STUDY OF THE OMEGA PHASE TRANSFORMATION IN A ZIRCONIUM-NIOBIUM ALLOY Ph.D. Thesis
Nestor John Zaluzec 1979 352 p
(Contract EY-76-C-02-1198)
(COO-1198-1279) Avail: NTIS HC A16/MF A01

Examination of the as-quenched omega phase morphology shows that the domain size of Zr-15% Nb is on the order of 30 A. No alignment of omega domains along < 222 > beta directions was observed and samples having undergone thermal cycling in thin foil form did not develop a long-period structure

of alternating beta and omega phases below the omega transformation temperature. DOE

N80-20386# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
FATIGUE CRACK PROPAGATION IN HASTELLOY X WELD METAL
T. Weerasooriya Nov. 1979 24 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6999) Avail: NTIS HC A02/MF A01

The fatigue crack growth rate of Hastelloy X weld metal increased with stress intensity, temperature, and inverse frequency. The results were correlated with the equation da/dN = (delta K)/sup n/, for constant frequency or constant temperature. The values of A and n were computed with a linear regression algorithm. With decreasing frequency at constant delta K and constant temperature (538 C) fatigue crack growth rates approach an upper limit. Fatigue crack growth rate of the weld metal was lower than that reported for base metal at 538 C and lower at 649 C for a frequency of 1 Hz. DOE

N80-20387# Argonne National Lab., Ill.
GRAIN-BOUNDARY DIFFUSION: STRUCTURAL EFFECTS, MODELS AND MECHANISMS
N. L. Peterson 1979 59 p refs Presented at the Am. Soc. of Metals Seminar, Milwaukee, 15-16 Sep. 1979
(Contract W-31-109-eng-38)
(CONF-7909100-1) Avail: NTIS HC A04/MF A01

Anisotropy, effect of orientation, crystallographic transformation, boundary type, dislocation dissociation, pressure, and isotope effects were considered. Diffusivity is different for various boundaries. Dissociated dislocation and stacking faults are not efficient paths for grain boundary diffusion. Results suggest a vacancy mechanism along the dislocation core, and involves atomic jumps away from the back towards the dislocation as well as jumps along the core. Measurements were made on nickel and silver. DOE

N80-20388# Lehigh Univ., Bethlehem, Pa.
PRESSURE SINTERING AND CREEP DEFORMATION: A JOINT MODELING APPROACH Progress Report, 1 Jan. - 31 Dec. 1979
M. R. Notis Oct. 1979 22 p refs
(Contract EY-76-S-02-2408)
(COO-2408-6) Avail: NTIS HC A02/MF A01

Work related to microchemical and microstructural aspects of the joint modeling of pressure sintering and creep in ceramic oxides is reported. Quantitative techniques for the microchemical analysis of ceramic oxides and for the examination of impurity segregation effects in polycrystalline ceramic materials were developed. This has included fundamental absorption corrections for the oxygen anion species as a function of foil thickness. The evolution in microstructure during the transition from intermediate stage to final stage densification during hot pressing of cobalt oxide and preliminary studies with doped oxides were studied. DOE

N80-20389# California Univ., Livermore. Lawrence Livermore Lab.
BLACK CHROME OUTGASSING STUDY
Tom Best 1979 15 p Presented at the Integrated Contractor Conf., Oak Ridge, Tenn., 25-27 Sep. 1979
(Contract W-7405-eng-48)
(UCRL-82797) Avail: NTIS HC A02/MF A01

The outgassing of black chromium was studied in order to establish the vacuum outgassing characteristics for the pumping speed requirements. The method and equipment employed to conduct the outgassing studies are described along with the samples of black chromium used. The outgassing was studied under three conditions: (1) at ambient temperature, (2) at 350 C, and (3) at ambient temperature after the 350 C bake. The results are presented. A.W.H.

N80-20390# Battelle Pacific Northwest Labs., Richland, Wash.
CRYSTALLIZATION AND IRRADIATION EFFECTS IN AN AMORPHOUS ALLOY OF TYPE Fe40Ni38Mo4B18
N. Azam, L. LeNaour, C. Rivera, P. Grosjean, P. Sacovy, and J. Delaplace 1979 16 p refs Transl. into ENGLISH from J. Nucl. Mater. (Netherlands), v. 83, 1979 p 298-304
(PNL-TR-372) Avail: NTIS HC A02/MF A01

The structure of an amorphous alloy of the composition Fe40Ni38Mo4B18 either in the untreated fabricated state, or after various thermal treatments, or after irradiation with heavy ions is studied. The amorphous state is not modified by heat treatments at temperatures below 300 C. After several hours at 350 C, crystallization begins by forming crystals of an FeNi-base solid solution. The crystallization is complete after a two hour treatment at 500 C. This alloy, bombarded with 500 keV Ni(+) ions, proved to be practically insensitive to irradiation at the ambient temperature at high doses (6 x 10 to the 16th power ions/sq cm, i.e., approximately 100 dpa). A 100 to 150 C lowering of the crystallization temperature is observed under irradiation. DOE

N80-20391# Massachusetts Inst. of Tech., Cambridge. Corrosion Lab.
THE EFFECT OF PLASTIC DEFORMATION ON THE TRANSPORT OF HYDROGEN IN NICKEL
M. Kurkela and R. M. Latanision Sep. 1979 9 p refs Submitted for publication
(Contract N00014-78-C-0002; NR Proj. 036-127)
(AD-A077660; TR-3) Avail: NTIS HC A02/MF A01 CSCL 11/6

The permeation of hydrogen into crystalline metals may occur in part by lattice diffusion, by grain boundary, or other short circuit diffusion, or, in the case of specimens undergoing plastic deformation, by dislocation transport. In this work, electrochemical permeation measurements indicate that the apparent diffusivity of hydrogen is increased by several orders of magnitude when permeation specimens are plastically deformed and simultaneously charged with hydrogen. GRA

N80-20392# Bureau of Mines, Washington, D. C. Div. of Ferrous Metals.
MOLYBDENUM: MINERAL COMMODITY PROFILES
John T. Kummer May 1979 30 p refs
(PB80-110885) Avail: NTIS HC A03/MF A01 CSCL 08I

A refractory metallic element used principally as an alloying agent in steels, cast irons, and superalloys to enhance hardenability strength, toughness, and wear and corrosion resistance, molybdenum is primarily added in the form of molybdic oxide or ferromolybdenum, it is frequently used in combination with chromium, columbium, manganese, nickel, tungsten, or other alloy metals to achieve desired metallurgical properties. Data presented include industry structure, uses, reserves-resources, technology, supply-demand relationships, byproducts and coproducts, strategic considerations, economic factors and problems, operating factors and problems, and outlook to 2000. GRA

N80-20393# Office of Technology Assessment, Washington, D. C.
TECHNICAL OPTIONS FOR CONSERVATION OF METALS: CASE STUDIES OF SELECTED METALS AND PRODUCTS
Sep. 1979 128 p
(PB80-102619; OTA-M-97; LC-79-600172) Avail: NTIS HC A07/MF A01 CSCL 11F

The kinds and amounts of waste that occur in this nation's use of eight critical metals and the technical options for reducing that waste are examined. The eight metals studied are: iron, copper, aluminum, manganese, chromium, nickel, tungsten, and platinum. In their levels of import dependence and in other respects, these metals are a representative sample of commercially important metals. GRA

N80-20394# National Technical Information Service, Springfield, Va.
STRESS CORROSION OF STEEL. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - 1979
William E. Reed Jan. 1980 306 p Supersedes NTIS/PS-78/1318; NTIS/PS-77/1179; NTIS/PS-76/1046; NTIS/PS-75/785
(PB80-803729; NTIS/PS-78/1318; NTIS/PS-77/1179; NTIS/PS-76/1046; NTIS/PS-75/785) Avail: NTIS HC $30.00/MF $30.00 CSCL 11F

The citations cover crack propagation, fracture, tests, surface finishing, working, coatings, deformation, and fatigue in relation

to stress corrosion. The majority of studies in this report are on nuclear reactor, aircraft, and spacecraft materials. Stainless steel stress corrosion is excluded. This updated bibliography contains 299 abstracts, 36 of which are new entries to the previous edition. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N80-20395 Case Western Reserve Univ., Cleveland, Ohio.
SYNTHESIS, CHARACTERIZATION, AND PROPERTIES OF ISOPRENE-METHYL METHACRYLATE COPOLYMERS Ph.D. Thesis
Alexander Sfirakis 1979 231 p
Avail: Univ. Microfilms Order No. 8001474

A series of well characterized isoprene-methyl methacrylate copolymers and the corresponding homopolymers were prepared by an emulsion polymerization technique at 50 C using a modified GR-S formulation. An equation was developed relating the glass transition temperature to the density of the copolymer. The dependence of penetrant transport properties on penetrant molecular size and on the composition of the copolymers was investigated along with dynamic mechanical and dielectric properties of the polymers. The knowledge obtained from this investigation is desirable for elucidation of structure property relationships, plasticization phenomena, and any modification of polymer structure induced by the presence of penetrants. Dissert. Abstr.

N80-20396 Washington State Univ., Pullman.
ELECTROCHEMICAL POLYMERIZATION AND DEPOSITION ON CARBON FIBERS Ph.D. Thesis
James Jerome Jakubowski 1979 124 p
Avail: Univ. Microfilms Order No. 8007240

The electrodic polymerization on carbon fibers of a variety of monomers having different functional groups was investigated. The effect of such polymer coating on the properties of polymer composites prepared from the coated fibers was demonstrated. The electropolymerization of novel monomers was pursued in some detail. In addition to usual vinyl polymerizations, some novel cyclic monomers were identified as capable of producing the desired polymer layer on fibers under appropriate polymerization conditions. In many instances, grafting of the surface polymer to the fiber was observed. Composite specimens were prepared by the incorporation of the coated fibers in an epoxy matrix. It was demonstrated that the effect of electropolymerization on the interfacial properties of the resulting composite was manifested in variations of the measured interlaminar shear and impact strengths of the composite specimens. Other observations are reported. Dissert. Abstr.

N80-20397*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Chemistry.
A FUNDAMENTAL APPROACH TO ADHESION: SYNTHESIS, SURFACE ANALYSIS, THERMODYNAMICS AND MECHANICS Final Report
Ranjani Sriwardane and James P. Wightman Mar. 1980 128 p refs
(Grant NsG-1124)
(NASA-CR-162903) Avail: NTIS HC A07/MF A01 CSCL 11A

The acid-base properties of titanium 6-4 plates (low surface area) were investigated after three different pretreatments, namely Turco, phosphate-fluoride and Pasa-Jell. A series of indicators was used and color changes were detected using diffuse reflectance visible spectroscopy. Electron spectroscopy for chemical analysis was used to examine the indicator on the Ti 6-4 surface. Specular reflectance infra-red spectroscopy was used to study the adsorption of stearic acid from cyclohexane solutions on the Ti 6-4 surface. A.R.H.

N80-20398*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPOSITE WALL CONCEPT FOR HIGH TEMPERATURE TURBINE SHROUDS: SURVEY OF LOW MODULUS STRAIN ISOLATOR MATERIALS
Robert C. Bill, Gordon P. Allen, and Donald W. Wisander Mar. 1980 27 p refs Presented at the 25th Ann. Intern. Gas Turbine Conf., New Orleans, 9-13 Mar. 1980; sponsored by ASME Prepared in cooperation with Army Aviation Research and Development Command, Cleveland
(NASA-TM-81443; AVRADCOM-TR-80-C-7; E-363) Avail: NTIS HC A03/MF A01 CSCL 11A

Plasma sprayed yttria stabilized zirconium oxide turbine seal specimens, incorporating various low modulus porous metal strain isolator pads between the zirconium oxide and a dense metal substrate, were subjected to cyclic thermal shock testing. Specimens that had a low modulus pad composed of sintered FeNiCrAlY fibermetal survived 1000 thermal shock cycles without spalling of the ceramic. A figure of merit for the low modulus pad materials taking into consideration the elastic modulus, thermal conductivity, strength, and oxidation resistance of the pad was proposed, and showed reasonable agreement with the thermal shock results. A potential surface distress problem on the zirconium oxide, associated with nonuniform temperature distribution and rapid stress relaxation was identified. One approach to solving the surface distress problem through application of laser surface fusion of the zirconium oxide layer showed some promise, but improvements in the laser surface fusion process are necessary to prevent process associated damage to the ceramic. K.L.

N80-20399# ARO, Inc., Arnold Air Force Station, Tenn.
THERMAL RESPONSE AND REUSABILITY TESTS OF ADVANCED FLEXIBLE REUSABLE SURFACE INSULATION (RSI) AND CERAMIC TITLE RSI SAMPLES AT SURFACE TEMPERATURES TO 1200 DEGREES F Final Report
E. C. Knox AEDC, Arnold AFS, Tenn. May 1979 46 p refs
(AD-A077887; AEDC-TSR-79-V29) Avail: NTIS HC A03/MF A01 CSCL 20/13

The surface analysis of anodes and cathodes from phosphoric acid electrolytes by ion scattering spectrometry (ISS) and secondary ion spectrometry (SIMS) shows that contamination can occur under a variety of conditions. Contamination can occur both during and after anodization and either with or without the electrodes connected. These results point up the dynamic and ever changing character of the anodization process and suggests reasons for poor reproducibility of oxide chemistry and morphology. GRA

N80-20400# California Univ., Los Angeles. Dept. of Materials.
STRUCTURE AND PROPERTIES OF GLASSES Final Report, 1 Oct. 1978 - 30 Sep. 1979
John D. Mackenzie Nov. 1979 12 p refs
(Grant AF-AFOSR-0019-79; AF Proj. 2303)
(AD-A080071; AFOSR-80-0053TR) Avail: NTIS HC A02/MF A01 CSCL 11/2

The elastic modulus of glasses are shown to be affected by ion-exchange because of the loss of unoccupied space in the glass network. The water content of beryllium fluoride glasses affects the ionic content although the fluorine ion is the current carrier because of defects in the glass caused by water. Transparent composites have been prepared by impregnating porous glass with polymethylmethacrylate. GRA

N80-20401# California State Dept. of Transportation, Sacramento. Office of Transportation Lab.
X-RAY DIFFRACTION ANALYSIS OF SELECTED PAINT PIGMENTS Final Report, 1975 - 1978
Bill Chapman Mar. 1979 97 p refs
(PB80-113061; TL-635314; FHWA/CA/TL-79/05) Avail: NTIS HC A05/MF A01 CSCL 11C

The use of X-ray diffraction to monitor pigment and filler contents of white and yellow traffic paints was investigated using dried films and extracted pigments. Correlations to titanium dioxide and lead chromate were acceptable. Correlations for talc and calcium carbonate ranged from poor to fair. Some insight into improving these correlations is discussed. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.

N80-20402* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ATOMIC HYDROGEN STORAGE Patent

John A. Woollam, inventor (to NASA) Issued 18 Mar. 1980 3 p Filed 29 Sep. 1977 Supersedes N78-19907 (16 - 10, p 1365) Division of U.S. Patent Appl. SN-67432, filed 13 Apr. 1976, US Patent-4,077,788

(NASA-Case-LEW-12081-2; US-Patent-4,193,827; US-Patent-Appl-SN-837794; US-Patent-Class-149-1; US-Patent-Class-423-648R; US-Patent-Appl-SN-676432) Avail: US Patent and Trademark Office CSCL 21D

Atomic hydrogen, for use as a fuel or as an explosive, is stored in the presence of a strong magnetic field in exfoliated layered compounds such as molybdenum disulfide or an elemental layer material such as graphite. The compound is maintained at liquid temperatures and the atomic hydrogen is collected on the surfaces of the layered compound which are exposed during delamination (exfoliation). The strong magnetic field and the low temperature combine to prevent the atoms of hydrogen from recombining to form molecules.

Official Gazette of the U.S. Patent and Trademark Office

N80-20403# Indian Inst. of Science, Bangalore. High Energy Solids Lab.

THERMAL DECOMPOSITION AND COMBUSTION STUDIES ON POTASSIUM PERCHLORATE/POLYSTYRENE PROPELLANT SYSTEMS

K. Kishore, V. R. Pai Verneker, and M. R. Sunitha 12 Jun. 1979 37 p refs Backup document for AIAA Synoptic scheduled for publication in AIAA Journal in Aug. or Sep. 1980

(Log-J11458) Avail: NTIS HC A03/MF A01

The thermal decomposition (TD) behavior of potassium perchlorate (KP) polystyrene (PS) system was studied in detail as well as the occurance of condensed-phase reactions in KP/PS propellant combustion. The TD and Combustion behavior of KP/PS propellant system was compared to that of ammonium perclorate/PS. Significant results are reported. R.C.T.

N80-20404*# Kentucky Univ., Lexington. Inst. for Mining and Minerals Research.

EXPERIMENTAL LABORATORY MEASUREMENT OF THERMOPHYSICAL PROPERTIES OF SELECTED COAL TYPES Final Report

William G. Lloyd 13 Sep. 1979 113 p refs Prepared for JPL

(Contracts NAS7-100; JPL-955381)

(NASA-CR-162913; JPL-9950-317) Avail: NTIS HC A06/MF A01 CSCL 21D

A number of bituminous coals of moderate to high plasticity were examined, along with portions of their extrudates from the JPL 1.5-inch 850 F screw extruder. Portions of the condensed pyrolysis liquids released during extrusion, and of the gaseous products formed during extrusion were also analyzed. In addition to the traditional determinations, the coals and extrudates were examined in terms of microstructure (especially extractable fractions), thermal analysis (especially that associated with the plastic state), and reactivity towards thermal and catalyzed hydroliquefaction. The process of extrusion increases the fixed carbon content of coals by about 5% and tends to increase the surface area. Coals contaning 25% or more DMF-extractable material show an increase in extractables as a result of extrusion; those initially containing less than 20% extractables show a decrease as a result of extrusion. Both the raw and extruded samples of Kentucky no. 9 coal are highly reactive towards hydroliquefaction, undergoing conversions of 75 to 80% in 15 min and 85-94% in 60 min in a stirred clave. A.R.H.

N80-20405# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.

EVALUATION OF FUEL CHARACTER EFFECTS ON THE F101 ENGINE COMBUSTION SYSTEM Final Report, 1 Aug. 1977 - 30 Sep. 1978

O. C. Gleason, T. L. Oller, M. W. Shayeson, and D. W. Bahr Jun. 1979 200 p refs

(Contract F33615-77-C-2043; AF Proj. 3048)

(AD-A077860; R79AEG405; AFAPL-TR-79-2018; CEEDO-TR-79-07) Avail: NTIS HC A09/MF A01 CSCL 21/4

Results of a program to determine the effects of broad variations in fuel properties on the performance, emissions and durability of the General Electric F101 augmented turbofan engine main combustion system are presented. Combustor rig tests conducted at engine idle, takeoff, cruise, dash, cold day ground start and altitude relight operating conditions with 13 different fuels are described. Fuel nozzle fouling tests conducted with the same fuels are also described. The test fuels covered a range of hydrogen contents (12.0 to 14.5%), aromatic type (monocyclic and bicyclic), initial boiling point (285 to 393 K), final boiling point (552 to 679 K) and viscosity (0.83 to 3.25 millimeters 2/s at 300 K). At high power conditions, fuel hydrogen content was found to have a very significant effect on liner temperature, smoke, and NOx levels. While smoke levels decreased with increasing hydrogen content, the levels were very low with all the fuels. At idle conditions, CO and HC levels correlated with fuel atomization/volatility parameters, but showed no relationship to hydrogen content. Cold day ground start and altitude relight also correlated with fuel atomization/volatility parameters, but showed no dependence on hydrogen content. Combustor liner life analyses yielded relative life predictions of 1.00, 0.72, 0.52, and 0.47 for fuel hydrogen contents of 14.5, 14.0, 13.0, and 12.0 percent, respectively. At the present state of turbine stator development, no fuel effect on life is predicted. Extended cyclic fuel nozzle valve gumming tests revealed significant effects of fuel type and temperature on nozzle life. The results correlated with laboratory thermal stability ratings of the fuels based on tube deposits alone. GRA

N80-20406# Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapons Systems Lab.

TNT EQUIVALENCY OF BENITE PROPELLANT

M. F. Leondi and J. P. Chaltagirone Aug. 1979 56 p

(AD-A077108; AD-E400354; ARLCD-TR-79017) Avail: NTIS HC A04/MF A01 CSCL 19/1

In support of the Army-wide modernization program, the Manufacturing Technology Div of the U.S. Army Armament Research and Development Command developed design standards for structures required to withstand the effects of an explosion. The use of these standards--in a safe and cost effective manner--requires that the airblast characteristics of the energetic materials used by the Army be empirically determined. Since the air blast capabilities of Benite propellant are not available in the current literature, a TNT equivalency test program was initiated. Its objective was to determine the maximum airblast output from detonation of Benite propellant in terms of peak pressure and positive impulse compared to known characteristics of a hemishperical surface burst of TNT. Peak side-on blast overpressure and scaled positive impulse were measured for Benite propellant, using configurations that simulate the handling of bulk material during processing and shipment. Quantities of 10.43 and 41.8 kg were tested in orthorhombic shipping containers and fiberboard boxes. TNT equivalency values for each test series were obtained as a function of scaled distance by comparison to known pressure, arrival time, and impulse characteristics for hemispherical TNT surface bursts. Pressure and impulse equivalencies were found to be less than 65% for all quantities tested. GRA

N80-20407# Chevron Research Co., Richmond, Calif.

REFINING AND UPGRADING OF SYNFUELS FROM COAL AND OIL SHALES BY ADVANCED CATALYTIC PROCESSES Quarterly Report, Jan. - Mar. 1979

R. F. Sullivan Apr. 1979 41 p

(Contract EX-76-C-01-2315)

(FE-2315-37) Avail: NTIS HC A03/MF A01

Pilot plant tests on the hydrotreating of SRC-2 process product indicate that this coal-derived feed is suitable for refining using advanced commercial petroleum processing technology. Nitrogen

in the whole SRC-2 process product can be reduced to a concentration of less than 0.5 ppM in a single catalytic stage. Sulfur and oxygen can also be reduced to low levels; and at high severity, most of the aromatic compounds are converted to naphthenes. As the processing severity is decreased, product nitrogen increases and the product becomes more aromatic. In the latter case, further hydrotreating of the naphtha is required before it can be fed to the second stage of a catalytic reformer. Depending on the severity employed, the jet boiling range product must be further hydrogenated for specification jet fuel. Experiments were made to determine appropriate conditions for these processing steps. DOE

N80-20408# Naval Research Lab., Washington, D. C. Radiation Technology Div.
THERMAL INITIATION OF HIGH EXPLOSIVES WITH AN ELECTRON BEAM Final Report
A. Stolovy, E. C. Jones, Jr., J. B. Aviles, Jr., and A. I. Namenson 8 Nov. 1979 13 p refs
(RR0120141)
(AD-A077535; AD-E000338; NRL-8350) Avail: NTIS HC A08/MF A01 CSCL 19/1

The condition under which high explosives undergo thermal initiation were studied under dynamic conditions by measuring the temperature of samples while they were irradiated by 40 MeV electrons at the NRL Linac. Values were obtained for the thermal initiation threshold and the explosion temperature for the following high explosives: Composition B, TATB, HBX-1, PBX-9404 and Pentolite. Theoretical values based upon a single rate Arrhenius formula are in reasonable agreement with the experimental results. GRA

N80-20409# Atlantic Research Corp., Alexandria, Va. Research and Technology Div.
EXPERIMENTAL AND ANALYTICAL STUDY OF EROSIVE BURNING OF SOLID PROPELLANTS Annual Report, 1 Oct. 1978 - 30 Sep. 1979
Merrill K. King, Robert Beddini, Mohan Razdan, and Kenneth Kuo Nov. 1979 44 p refs
(Contract F49620-78-C-0016; AF Proj. 2308)
(AD-A079618; AFOSR-79-1323TR) Avail: NTIS HC A03/MF A01 CSCL 21/9

At Atlantic Research, erosive burning characteristics of eleven composite propellants were measured and found to agree well with predictions of a simplified first-generation model under most conditions. A second-generation more fundamental model for predicting burning rate versus pressure and cross flow velocity, given only compositional data, also yield predictions in close agreement with data. The most important parameter affecting crossflow sensitivity was no-cross flow burning rate, erosion sensitivity decreasing with increasing base rate. ARAP completed modifications to its SPEC model to enable calculation of cylindrical flows and performed preliminary evaluation for cold-flow simulations and erosive burning. Motor port diameter was identified as a key erosive burning scaling parameter through its effect on threshold conditions, and a simplified scaling relation was developed and verified. In addition, ARAP investigated the effects of combustion-turbulence interaction on predicted erosive burning. Penn State measured erosive burning rates of three AP-composite formulations in a device designed to give a well-defined turbulent boundary layer. The data agreed well with predictions made using a Penn State model based on a 2D turbulent boundary layer approach. Correlations relating burning rate to free stream velocity, and pressure were developed. The model was also extended to axisymmetric cylindrical port flow. GRA

N80-20410# Department of Energy, Bartlesville, Okla. Energy Technology Center.
THERMODYNAMICS OF ORGANIC COMPOUNDS Final Technical Summary Report, 1 oct. 1978- 30 Sep. 1979
William D. Good, Donald W. Scott, Norris K. Smith, Susan Lee-Bechtold, and Ann G. Osborn 1979 19 p refs
(AFOSR ISSA 79-0007; AF Proj. 2308)
(AD-A080072; AFOSR-80-0076TR) Avail: NTIS HC A02/MF A01 CSCL 21/4

Measurements were completed of the enthalpy of combustion of the ramjet fuel RJ-6. Measurements of the enthalpy of combustion of hexacyclic exo,exo-dihydrodinorbornadiene, hexacyclic endo,endo-dihydrodinorbornadiene and exo-tetrahydrodicyclopentadiene are in progress. Vapor pressure measurements were made on exo-tetrahydrodicyclopentadiene. Synthesis and purification of alkylindans and alkylnaphthalenes with high steric interactions continue at Oklahoma State University. GRA

N80-20411# IIT Research Inst., Chicago, Ill. Engineering Div.
INITIATION MECHANISMS OF SOLID ROCKET PROPELLANT DETONATION Final Interim Report, 1 Jan. 1975 - 30 Sep. 1979
A. N. Takata Nov. 1979 60 p refs
(Contract F44620-75-C-0059; AF Proj. 2308)
(AD-A079986; IITRI-J6352-FR; AFOSR-79-1324TR; IR-4) Avail: NTIS HC A04/MF A01 CSCL 21/8

The purpose of this study is to identify mechanisms responsible for several accidental detonation of high-energy solid rocket propellant motors. During the past year a computer model was developed to predict the amount of foam or melt generated in cracks following sudden exposure of the crack to a cavity containing higher temperature/pressure gases than exists within the crack. In addition, an experimental design was developed to study deflagration to detonation transitions (DDT). Analytical predictions suggest that DDT can occur as a consequence of burning propellant cracks provided molten propellant is generated within the burning propellant cracks and the cracks are subjected to sufficiently high amplitude stress waves. The stronger the stress waves are, the less the amount of melt needed for DDT. DDT can be initiated by single-burning cracks in close proximity to the motor case, or by multiple burning cracks which are similarly oriented by respect to each other and closely spaced. GRA

N80-20412# Institute of Gas Technology, Chicago, Ill.
SYNTHETIC FUELS FROM PEAT GASIFICATION
D. V. Punwani, S. A. Weil, J. E. Paganessi, and M. J. Kopstein (DOE, Washington, D.C.) 1979 7 p Presented at the 14th Intersoc. Energy Conversion Eng. Conf., Boston, 5-10 Aug. 1979
(Contract EW-78-C-19-0042)
(CONF-790803-55) Avail: NTIS HC A02/MF A01

U.S. peat resources are estimated to be about 1440 quads. Tests were conducted in laboratory and process development unit-scale equipment using peats. It was found that conversion of peat to synthetic fuel is technically feasible. The important gasification characteristics of the three peats is discussed. The peatgas process is described along with highlights of its economics for converting peat to substitute natural gas (SNG), benzene, and fuel oil. On the basis of the gasification characteristics, compared to coal, peat is a better raw material from which to make SNG as well as gasoline blending feedstock, in that a greater fraction of the energy results in these products and requires milder operating conditions. Also compared to coal, peat gasification permits more flexibility in the relative yields of gas and liquid hydrocarbons. The estimates show that the economics of converting peat (containing 50% moisture) to SNG is competitive with those of converting Eastern coal to SNG. DOE

N80-20413# Chem Systems, Inc., New York.
LIQUID PHASE METHANATION/SHIFT PILOT PLANT OPERATION AND LABORATORY SUPPORT WORK Final Report, 1 Jul. 1976 - 30 Nov. 1978
Mar. 1979 330 p
(Contract EX-76-C-01-2036)
(FE-2036-37) Avail: NTIS HC A15/MF A01

The liquid phase methanation (LPM) Pilot Plant construction was completed and shipped to the HYGAS Pilot Plant in Chicago, Illinois. The unit was reassembled and installed. Operations included seven runs totaling 2347 hours of on-stream time with 122 hours of methanation of HYGAS synthesis gas and 193 hours of steam-methane reformer gas. The basic operability of the process was demonstrated in this 50 fold scale-up from a smaller process development unit. Catalyst rate constants were determined and the LPM kinetic model was checked over a wide range of process conditions for three different catalysts. Information accumulated also includes extent of the shift reaction, by-product selectivities, catalyst bed fluidization and circulating

oil stability. An experimental program studying the rates of carbon formation in vapor-phase methanators was conducted. DOE

N80-20414# Rockwell International Corp., Canoga Park, Calif. Environmental and Energy Systems Div.
ADVANCED DEVELOPMENT OF A SHORT-RESIDENCE-TIME HYDROGASIFIER Quarterly Technical Progress Report, 1 Jan. - 31 Mar. 1979
Apr. 1979 86 p refs
(Contract ET-78-C-01-3125)
(FE-3125-5; QTPR-2) Avail: NTIS HC A05/MF A01

Minor modification to the 1-TPH design were made so that the injector could be accommodated within the existing pressure vessel as a nominal 3/4-TPH hydrogasifier injector. One injector made out of Type 321 stainless steel was fabricated and delivered to the test stand. Other existing reactor hardware components were reevaluated with the viewpoint of assessing the need for any modifications. The needed modifications were completed, and all of the hardware was readied for installation at the test stand. Design work on the hydrogen cooled recuperator was initiated. The purpose of the recuperator is to recover the sensible heat from the reaction products by transferring it to the reactant hydrogen. A three module, shell and tube, counterflow type of heat exchanger concept has been chosen for this recuperator, and detailed design drawings were nearly completed. DOE

N80-20415# Oklahoma State Univ., Stillwater.
PHOTOCHEMICAL CONVERSION OF COAL TO GASOLINE IN AN ENTRAINED BED REACTOR Ph.D. Thesis
S. Sundaram Jul. 1979 252 p refs
(Contract EY-76-S-05-5020)
(ORO-5020-T1) Avail: NTIS HC A12/MF A01

Reading anthracite, Pittsburg Hi-Seam, Illinois No. 6, Utah Emery, Montana Rosebud, coals and synthane char were entrained in a rapidly flowing stream of hydrogen and then interacted with photoproduced hydrogen atoms. The reactivity of Illinois No. 6 coal was studied in detail. Products were collected in traps cooled by liquid nitrogen. Gas yields qualitatively decrease in the order given, i.e., with decreasing rank. The gaseous hydrocarbon produced corresponded to gasoline in the C1-C8 range, all isomers present and identified by GC-MS. The liquid products contained benzene, toluene, xylenes, naphthalenes, phenanthrene, pyrene, fluoranthene, benzanthracene, and benzopyrenes. The results suggest that the product distribution, yield and percent conversion are probably controlled by a rate limiting step in which phenanthrene type precursors are cracked from the coal surface and followed by secondary H atom reactions to produce smaller hydrocarbons. DOE

N80-20416# Department of Energy, Pittsburgh, Pa. Energy Technology Center.
COAL LIQUEFACTION WITH SYNTHESIS GAS
H. R. Appell, R. D. Miller, E. G. Illig, E. C. Moroni, and F. W. Steffgen Sep. 1979 65 p refs
(PETC/TR-79/1) Avail: NTIS HC A04/MF A01

The effects of changing gas composition, temperature, pressure, solvents, catalysts and coal types were studied to better understand the process fundamentals and to lay the groundwork for studies in continuous reactors on a larger scale. A variety of coals were converted in batch autoclaves to a low sulfur fuel oil at temperature of 425 C and pressures of 2200 to 2400 psig, using 1:1 (H2:CO) synthesis gas at reaction times of 30 to 60 minutes at temperature. Although early work suggested that lignites could be readily liquefied without added catalytic agents, later experiments showed that a greatly improved product could be obtained by adding pyrite, which is normally present only in small amounts. Pyrite or, in particular, its reduction product pyrrhotite, appear to be important catalysts for coal liquefaction, and, in general, the reactivity of coals correlates well with the pyrite (or iron plus sulfur) content. DOE

N80-20417# Department of Energy, Pittsburgh, Pa.
TRACE AND MINOR ELEMENT ANALYSES OF COAL LIQUEFACTION PRODUCTS
R. G. Lett, J. W. Adkins, R. R. DeSantis, and F. R. Brown Aug. 1979 37 p refs
(PETC/TR-79/3) Avail: NTIS HC A03/MF A01

The feed coal and products from a single batch of a long term liquefaction run on the 400 lb coal/day process development unit were sampled. Trace and minor element determinations were made on the Virginia hvAb feed coal, gross liquid product, and centrifuged liquid product and centrifuge residue from both the first and second centrifuging of the liquid product. Spark source mass spectrometry was used to determine the distribution and general level of about sixty elements. More precise determinations of specific trace (copper, chormium, manganese, nickel, zinc, lead, and cadmium) and minor elements (iron, silicon, aluminum, magnesium, and potassium) were made for elemental balance purposes. Results are compared with those previously obtained from a Kentucky hvBb coal run. Centrifugation of the liquid product from the West Virginia coal results in a preferential removal of iron and several other elements which were not observed in the Kentucky coal run. DOE

N80-20418# Institute of Gas Technology, Chicago, Ill.
DEVELOPMENT OF COMBUSTION DATA TO UTILIZE LOW-BTU GASES AS INDUSTRIAL PROCESS FUELS. PROJECT 61004. SPECIAL REPORT NO. 7: PREMIX TUNNEL BURNER
R. T. Waibel and E. S. Fleming May 1979 41 p refs
(Contract EX-76-C-01-2489)
(FE-2489-41) Avail: NTIS HC A03/MF A01

Data were gathered to determine the performance of a premix tunnel burner when retrofit with three low Btu fuel gases. The burner was fired on a pilot scale test furnace with a load simulating one zone of a continuous melting pot or one instant during the heat up of a batch melter. The low Btu fuel gases used for these combustion trials were Koppers-Totzek oxygen, Wellman-Galusha air, and Winkler air. All of the low Btu fuel gases exhibited stable flames when directly retrofit on the burner except Winkler air, which required a pilot flame to prevent blowoff. Koppers-Totzek oxygen gave a thermal efficiency somewhat greater than that for natural gas, while both Wellman-Galusha and Winkler air fuel gases were significantly lower. All of these fuel gases had flame lengths that were longer than that for natural gas. DOE

N80-20419# Energy and Environmental Analysis, Inc., Arlington, Va.
INDUSTRIAL FUEL CHOICE ANALYSIS MODEL VOLUME 2: APPENDICES TO MODEL DOCUMENTATION
Jan. 1979 160 p refs
(Contract EJ-78-C-01-2832)
(DOE/EIA-2832/1-Vol-2-App) Avail: NTIS HC A08/MF A01

Description, documentation, and other information are included in these appendices dealing with industrial fuel choices; energy consumption data base; major fuel burning installation survey; American Boiler Manufacturers Association data file; midrange energy forecasting system; projection method; capacity utilization rates; nonboiler characteristics; boiler capital and O & M cost data; nonboiler capital and O & M cost data; approach to estimating energy impacts of the conversion regulatory program index or acronyms. DOE

N80-20420# Wayne State Univ., Detroit, Mich. Coll. of Engineering.
FLAME PROPAGATION, AUTOIGNITION AND COMBUSTION IN ALCOHOL-PETROLEUM-AIR MIXTURES AND OTHER ALTERNATIVE FUELS Final Report, 1 Aug. 1977 - 31 Dec. 1978
N. A. Henein Sep. 1979 11 p
(Contract EC-77-S-02-4486)
(COO-4486-5) Avail: NTIS HC A02/MF A01

The combination characteristics of the future alternative fuels in gasoline and diesel engines were investigated in order to develop future combustion engines designed for best energy conversion and minimum emissions. The process of combustion was studied both experimentally and theoretically. The experimental work consisted of instrumenting and running tests on three research engines and measuring the different combustion characteristics. The theoretical work included calculating and correlating the flame speed and ignition delay with different fuel and air properties and engine operating parameters. DOE

N80-20421# Worcester Polytechnic Inst., Mass.
KINETICS AND MECHANISMS OF CATALYTIC HYDROLIQUEFACTION AND HYDROGASIFICATION OF LIGNITE Quarterly Report, Apr.-Jun. 1979
Alvin H. Weiss 12 Jul. 1979 4 p
(Contract EF-77-S-01-2702)
(FE-2702-7) Avail: NTIS HC A02/MF A01

After an unsuccessful run in which lignite slurry coked to a solid mass in the reactor, operational problems were solved. Hydrogenation in the canister system at steady state was successfully carried out on anthracene oil (with and without catalyst) and on a 20% slurry of lignite and cobalt-molybdenum catalyst in anthracene oil at 425 C. Efforts were devoted to increasing the speed and accuracy of analytical procedures which are presently perceived as the limiting step in the accumulation of data. DOE

N80-20422# Mobil Research and Development Corp., Princeton, N. J.
EXPLORATORY STUDIES IN CATALYTIC COAL LIQUEFACTION Final Report, Jun. 1978 - Mar. 1979
D. D. Whitehurst, T. O. Mitchell, M. Farcasiu, and J. J. Dickert, Jr. Sep. 1979 167 p refs
(EPRI-AF-1184) Avail: NTIS HC A08/MF A01

Catalyst aging tests simulating H-coal conditions with Illinois No. 6 coal were run for approximately 10 days with Cyanamid 1442A (CoMo/Al2O3), Cyanamid NiMo/Al2O3, Armak NiMo/ Al2O3, Amocat 1A (CoMo/Al2O3), and Amocat 1B (Mo/Al2O3) catalysts. Fresh and aged catalysts were examined for hydrogenation, hydrocracking, isomerization, desulfurization, denitrogenation, and deoxygenation. Several minerals were also included in the tests. Fresh commerical catalysts, especially NiMo/Al2O3, appear to be undesirably active for the H-Coal process. All catalysts age extensively but the used catalysts are still quite active. Activities for all reactions are reduced in the presence of nitrogen compounds. It was found that 400 F product mixtures become more complex as catalysts age, and that the catalysts affect especially the highest boiling products, but lose the ability to lower molecular weight as they age. Hydrogen donor catalyst systems are described briefly. DOE

N80-20423# Sandia Labs., Albuquerque, N. Mex.
CATALYST CHARACTERIZATION IN COAL LIQUEFACTION Quarterly Report, 1 Apr. - 30 Jun. 1979
M. G. Thomas Oct. 1979 18 p refs
(Contract EY-76-C-04-0789)
(SAND-79-1969; QR-3) Avail: NTIS HC A02/MF A01

A charge of neutron activated CoMo catalyst was prepared for use in the H-Coal Process Demonstration Unit. Catalysts tested in a fixed bed with low ash feedstock and in ebullated and fixed beds with higher-ash containing feedstocks corroborate other evidence that the regions of high reflectivity near used catalyst surfaces are due to the pressure of containment mineral matter, primarily iron and titanium. Parametric experiments with coal, preasphaltene, asphaltene, and oil in tubing reactors show that production of hydrocarbon gases increases in the series oil < asphaltene < preasphaltene, that both a CoMo catalyst and pyrite addition lowers the production of C1 to C4 hydrocarbons, and that pyrite significantly increases the amount of CO and CO2 generated. DOE

N80-20424# Southwest Research Inst., San Antonio, Tex. Mobile Energy Div.
STABILITY SURVEY OF HYDROCARBON FUELS Final Report
J. N. Bowden Oct. 1979 35 p refs
(Contract EW-78-C-03-1778)
(BETC-1778-4) Avail: NTIS HC A03/MF A01

The storage stability characteristics of No. 2 diesel fuels, JP-4 turbine fuels, and unleaded and leaded gasolines were evaluated. The 43.3 C storage stability test, which included gum determinations after periods of 4, 8, 16, and 32 weeks, was conducted on all samples. The thermal stability of the JP-4 fuels was also measured. Results indicate that the JP-4 fuels are the most stable, followed by the unleaded gasolines, leaded gasolines, and the diesel fuels. None of the jet fuels showed any degree of deterioration during the 32 weeks of storage, while at least one of each type of gasolines and four diesel fuels appeared to have some measure of unstability. DOE

N80-20425# Fluor Engineers and Constructors, Inc., Irvine, Calif.
COAL LIQUEFACTION TEST CENTER Quarterly Technical Progress Report, Oct. - Dec. 1978
Jun. 1979 69 p
(Contract EX-76-C-01-1517)
(FE-1517-78) Avail: NTIS HC A04/MF A01

Repairs from the damage incurred during the August fire were completed along with major modifications to the J-A608C/D hydrogenation reactor recycle pumps. Integrated operation of the Cresap Pilot Plant was carried out for two periods of 24 and 40 hours during Runs 014 and 015. Extraction operations in the front end totaled 37 and 7 hours for these runs. On stream hydrogenation time in section 600 consisted of 154 hours processing feedstock from storage and 64 hours on fresh extract. Because of the short periods of stabilized operation, characterization data collected were minimal. However, it is estimated that depth of extraction was about 75% on coal during each run. Hydrogenation effected about 80% conversion of +880 F material and 60% sulfur reduction in final product. DOE

N80-20426# Conoco Coal Development Co., Library, Pa. Research Div.
ZINC HALIDE HYDROCRACKING PROCESS FOR DISTILLATE FUELS FROM COAL Annual Technical Progress Report, 1 Feb. 1978 - 31 Jan. 1979
C. W. Zielke, Melvyn Pell, C. R. Greene, J. T. Maskew, and R. T. Struck 15 May 1979 105 p refs
(Contract EX-76-C-02-1743)
(FE-1743-68) Avail: NTIS HC A06/MF A01

Final results from the continuous bench-scale work showed that single-stage liquefaction of Montana subbituminous coal can be operated up to 427 C and in multiple-stage operation, the final stage at 17.5 MPa can be as high as 496 C without coke formation. This will permit increased throughput and eliminate a melt extraction step in the process. A study of crushing and drying of subbitiminous coal showed that the oxygen level in the drying gases can be controlled to a level where no degradation of the coal results. An economic study comparing direct coal feeding with producing SRC-1 and feeding it to zinc chloride processing showed an incentive for direct coal feeding. DOE

N80-20427# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SURVEY OF BIOMASS GASIFICATION. VOLUME 1: SYNOPSIS AND EXECUTIVE SUMMARY
Jul. 1979 45 p
(Contract EG-77-C-01-4042)
(SERI/TR-33-239-Vol-1) Avail: NTIS HC A03/MF A01

The conversion of biomass into a clean burning gaseous fuel that can be used to retrofit existing gas/oil boilers, to power engines, to generate electricity, and as a base for synthesis of methanol, gasoline, ammonia, or methane is considered with emphasis on biomass gasification. Aspects reviewed include the technical background necessary for understanding the science, engineering, and commercialization of biomass; the present status of gasification processes; economics/gas conditioning; fuel synthesis; and the institutional role to be played by the federal government. Recommendations for future research and development are presented. DOE

N80-20428# McElroy (Ralph) Co., Austin, Tex.
PRODUCTION OF METHANE USING AN ANAEROBIC FILTER
Knud B. Pedersen Apr. 1979 20 p Transl. into ENGLISH of Produccion de Metano Usando un Filtro Anaerobico (Puerto Rico), 5 Aug. 1978 22 p Sponsored by DOE Prepared for Argonne National Lab., Ill.
(ANL-Trans-1164) Avail: NTIS HC A02/MF A01

The treatment of waste products using an anaerobic process results in methane gas as a by-product and this gas can be used as a source of energy. The viability of producing methane gas - under the conditions which are valid for Puerto Rico - from domestic sewage, using an anaerobic filter, are considered. DOE

N80-20429* Missouri Univ. -Rolla. Materials Research Center.
CHEMICAL AND PHYSICAL STABILITY OF REFRACTORIES FOR USE IN COAL GASIFICATION Quarterly Progress Report, 1 Aug. - 31 Oct. 1979
Abbas Fakhr and Delbert E. Day 31 Oct. 1979 25 p refs
(Contract EY-76-S-02-2904)
(COO-2904-14) Avail: NTIS HC A02/MF A01

The corrosion resistance of refractories, especially the bond phases, in high pressure/high temperature gases and liquids present in coal gasification environments are described. The results of completed exposures are given. Comparison of liquid versus vapor exposure, for various castables is given. As previously observed for castables exposed to pure steam, all the dense alumina castable had a higher strength after exposure to either the saturated vapor or immersed in liquid, compared with their controls (fired at 5000 F in air for 18 h). Results are reported.
DOE

N80-20430* Argonne National Lab., Ill.
SUPPORT STUDIES IN FLUIDIZED-BED COMBUSTION 1978 ANNUAL REPORT Annual Report, Jul. 1977 - Sep. 1978
I. Johnson, G. J. Vogel, S. H. D. Lee, D. S. Moulton, and F. F. Numes Aug. 1979 112 p refs
(Contract W-31-109-eng-38)
(PB80-112758; ANL/CEN/FE-78-10; EPA-600/7-79-203) Avail: NTIS HC A06/MF A01 CSCL 13B

Results of laboratory and process scale EPA studies supporting the national development of atmospheric and pressurized fluidized bed combustion (PFBC) of coal are presented. Limestone sulfation enhancement experiments showed CaCl2 and MgCl2 to be more effective than NaCl in increasing the pore size and hence the sulfation capability of calcined limestones. Experiments to evaluate coal pyrolysis char as a feedstock for FBC were conducted on Wyoming subbituminous coal pyrolyzed at about 650 C. Char combustion efficiencies were 94-99 percent. The use of oil shale for SO2 emission control in FBC was evaluated. Considerably larger quantities of shale (than limestone or dolomite) would be required because of shale's lower CaO content. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N80-20431 California Univ., San Diego.
DYNAMIC GREEN'S FUNCTIONS FOR LAYERED MEDIA AND APPLICATIONS TO BOUNDARY-VALUE PROBLEMS Ph.D. Thesis
Randy Jay Apsel 1979 374 p
Avail: Univ. Microfilms Order No. 8006878

A method to calculate the three-dimensional dynamic Green's functions for layered viscoelastic media is developed. The formulation of the method and the subsequent application to problems in theoretical seismology are presented. The formulation of an integral equation approach involving the Green's functions used to study boundary value problems and the subsequent application to problems in earthquake engineering are discussed. Dissert. Abstr.

N80-20432 Ottawa Univ. (Ontario).
THE PRESSUREMETER: APPLICATION OF PAVEMENT DESIGN Ph.D. Thesis
Jean-Louis Charles Briaud 1979 467 p
Avail: Univ. Microfilms Order No. 8005516

Special pressuremeter, termed the Briaud pressuremeter, has been designed and built specifically for use in pavement engineering; also, a standard test procedure has been established. Both the special pressuremeter and test procedure are proposed as a basis for the traffic load design of flexible airport pavements. The pressuremeter probe is short and monocellular, and the test measures a cyclic modulus. The short probe allows tests to be performed every 0.3 m from the pavement or ground surface down to a depth of 1.8 m. The Briaud pressuremeter is portable and relatively inexpensive, the test is of short duration, and the results give a direct assessment of the condition of the pavement with depth. Dissert. Abstr.

N80-20433 Tennessee Univ., Knoxville.
SEISMIC DESIGN OF REINFORCED CONCRETE BUILDINGS: AN INELASTIC RESPONSE SPECTRUM APPROACH Ph.D. Thesis
Prospero Dionisio Bernal 1979 212 p
Avail: Univ. Microfilms Order No. 8005367

The applicability of the inelastic response spectrum approach (IRSA) was evaluated as a tool for the design of moment resisting, reinforced concrete frames under seismic excitation. The applicability of this method can be measured by the accuracy (or lack of it) of the predicted inelastic demands when compared to those obtained from a rigorous, step-by-step, inelastic dynamic analysis. In order to test the applicability of the method, two frames were designed for various combinations of ground motions and design ductilities and then analyzed using DRAIN-2D, a computer program with inelastic dynamic analysis capabilities. Design procedures were developed to insure that the inelastic action in the frames designed according to the IRSA would be restricted to the beams. Dissert. Abstr.

N80-20434 Carnegie-Mellon Univ., Pittsburgh, Pa.
SPACE TRUSS DESIGN: THE POLYHEDRAL CHAIN GROUP Ph.D. Thesis
Martin Frank Rooney 1979 219 p
Avail: Univ. Microfilms Order No. 8003410

A method for the structural design of polyhedral chain three dimensional trusses conforming to four connected regular growth patterns is presented. The method employs artificial intelligence search techniques and knowledge of polyhedral truss behavior. An approximate method of analysis, using the behavior of an equivalent centroidal rigid frame to model the behavior of a polyhedral chain structure, is provided. A technique for numbering connector configurations is developed, and the point at which nonlinear behavior ensues is discussed. A FORTRAN program for generating, drawing, and performing geometrically nonlinear analysis on polyhedral chain structures is furnished.
Dissert. Abstr.

N80-20435 California Univ., Los Angeles.
SYSTEM IDENTIFICATION STRUCTURAL DYNAMICS: AN APPLICATION TO WIND FORCE ESTIMATION Ph.D. Thesis
Stepan Sahag Simonian 1979 225 p
Avail: Univ. Microfilms Order No. 8007449

A second order nonlinear dynamic programming filter developed to inexpensively handle large order linear dynamical system is applied to the wind force identification problem. The differential equations governing the along wind buffering of multistory structures by gusts are formulated. The floor level acceleration response power spectral density (PSD) matrices are derived in terms of PSD models for wind gusts. A detailed first order sensitivity analysis of the derived auto-PSD models is performed with respect to some unknown stucture and gust model paramters. Using a simulated and noise polluted version of an auto-acceleration PSD data, some of the unknown stuctural and gust parameters are identified using a Monte Carlo version of the recursive nonlinear dynamic programming filter in the frequency domain. Ambient vibration experimental considerations are discussed. Dissert. Abstr.

N80-20436 Washington Univ., Seattle.
STRUCTURAL EVALUATION OF SULPHUR-ASPHALT PAVEMENTS Ph.D. Thesis
Abdulaziz Turki Abdulla Al-Otaishan 1979 737 p
Avail: Univ. Microfilms Order No. 7927736

Sulphur asphalt mixes from a structural standpoint are evaluated. The principles of the rational method of pavement design were used in this study for the evaluation of the four sulphur asphalt test pavements located at US 69, Lufkin, Texas, US 77, Kenedy County, Texas, LA 108, Sluphur, Louisiana, and US 93-95, Boulder City, Nevada. Design curves based on Elastic theory and material equivalencies are reported. Other operational procedures as well as significant results are discussed.
Dissert. Abstr.

N80-20437*# National Aeronautics and Space Administration, Washington, D. C.
THE APOLLO SPACECRAFT: A CHRONOLOGY VOLUME 4, 21 JANUARY 1966 - 13 JULY 1974
Ivan D. Ertel, Roland W. Newkirk, and Courtney G. Brooks 1978 476 p refs
(NASA-SP-4009; LC-69-60008) Avail: NTIS MF A01; SOD HC CSCL 22B

This final volume of the chronology is divided into three parts: (1) preparation for flight, the accident, and investigation; (2) recovery, spacecraft redefinition, and the first manned flight; and (3) man circles the moon, the Eagle lands, and manned space exploration. Congressional documents, offical correspondence, government and contractor reports, memoranda, working papers, and minutes of meetings were used as primary sources. A relatively few entries are based on press releases and newspaper and magazine articles. A.R.H.

N80-20438# Virginia Polytechnic Inst. and State Univ., Blacksburg.
THE EFFECTS OF PITCHING RATE ON THE HYDRODYNAMIC PROPERTIES OF HYDROFOILS
M. C. Hyman Oct. 1979 8 p refs Presented at the AIAA/SNAME Conf. on Advanced Marine Vehicles, Baltimore, Md., 3 Oct. 1979
(Contract N00024-78-C-5610)
(AD-A079810; VPI-AERO-100) Avail: NTIS HC A02/MF A01 CSCL 20/4

Little or no test data is available to verify theory predicting lift, drag and pitching moment of a hydrofoil in the presence of pitching motion commonly encountered in hydrofoil craft. The present paper presents the results of a wind tunnel investigation of the effects of pitching motion on two hydrofoil configurations. The results are compared to prediction techniques given in the U.S.A.F. DATCOM (Ref. 1). Finally, a verified force and moment prediction technique is presented. GRA

N80-20439# Naval Postgraduate School, Monterey, Calif.
LIFT ANALYSIS ON THE BOW SEAL OF THE SURFACE EFFECT SHIP TESTCRAFT XR-3 M.S. Thesis
James R. Snider Sep. 1979 55 p refs
(AD-A078507) Avail: NTIS HC A04/MF A01 CSCL 13/10

Experimental test runs were conducted to determine lift forces acting on the bow seal of the captured air bubble testcraft, XR-3. These forces, plotted versus turn rate for varying center-of-gravity locations, are presented and analyzed. GRA

N80-20440# California Univ., Berkeley. Earthquake Engineering Research Center.
ANSR-2: ANALYSIS OF NONLINEAR STRUCTURAL RESPONSE, USER'S MANUAL
Digambar P. Mondkar and Graham H. Powell Jul. 1979 90 p refs
(Grant NSF ENV-76-04264)
(PB80-113301; UCB/EERC-79/17; NSF/RA-790266) Avail: NTIS HC A05/MF A01 CSCL 13B

A general purpose computer programs for the static and dynamic analysis of nonlinear structures is described. Both large displacements and inelastic effects are included. Several features of the program are discussed. The most important of these are: (1) a comprehensive restart option; (2) provision to allow static and dynamic analyses in any sequence; (3) provision for static analysis with prescribed nodal displacements as well as nodal loads; (4) provision for out-of-phase support motions to be specified for earthquake analysis; (5) provision for time delay (traveling wave) effects to be specified for forces and displacements in dynamic analyses; and (6) out-of-core solves for both symmetrical and unsymmetrical equations. GRA

N80-20441# National Bureau of Standards, Washington, D.C. Center for Materials Science.
THE SCIENCE OF CERAMIC MACHINING AND SURFACE FINISHING 2
Bernard J. Hockey, ed. and Roy W. Rice, ed. (NRL, Washington, D.C.) Oct. 1979 528 p refs Presented at Symp. held at Gaithersburg, Md., 13-15 Nov. 1978; sponsored by AFOSR, Bolling AFB, Washington, D.C., and Am. Ceramic Soc., Columbus, Ohio, ONR, Arlington, Va.
(PB80-110133; NBS-SP-562; LC-79-6000149) Avail: NTIS HC A23/MF A01 CSCL 13/4

The machining and surface finishing operations employed in the production and reliable use of ceramics are discussed. Areas of investigation include the mechanisms of abrasive machining and surface finishing, a technology assessment of machining and surface finishing, the effects of machining and surface finishing on ceramic properties, and the relation of hardness to machining. A.W.H.

N80-20442# Kentucky Bureau of Highways, Lexington. Div. of Research.
STATEWIDE SURVEY OF SKID RESISTANCES OF PAVEMENTS, 1978 Interim Report
Rolands L. Rizenbergs and James L. Burchett Jul. 1979 141 p
(PB80-106404; ; RR-528) Avail: NTIS HC A07/MF A01 CSCL 13B

Results of tests on 2,943 miles of state primary roads and 2,405 miles of state secondary roads are reported. About 10 percent of both the state primary mileage and the state secondary mileage had an average skid number of 28 or less. These pavements, in particular, should be considered for de-slicking. GRA

N80-20443# Connecticut Dept. of Transportation, Wethersfield. Bureau of Highways.
PAVEMENT RECYCLING-BITUMINOUS CONCRETE AND CONCRETE MIX DESIGNS Interim Report, Oct. 1978 - Mar. 1979
Robert Christman and Keith Lane Jul. 1979 76 p refs
(HPR Proj. 569)
(PB80-106263; FHWA/CT-569-1-79-10) Avail: NTIS HC A06/MF A01 CSCL 13B

Trial mixes developed from both salvaged bituminous concrete and portland cement concrete pavement materials were tested in the laboratory. Salvaged materials investigated included crushed and cold milled bituminous concrete and crushed 40 x 12 ft concrete pavement slabs with wire mesh reinforcing. Laboratory results indicated the feasibility of full scale bituminous recyling projects using central plant mixing of salvaged and virgin aggregate by the heat transfer method and both in place full depth and surface recycling. The concrete tests provided good results in terms of strength properties and demonstrated the potential of concrete recycling. Mesh separation and removal did not present any insurmountable problems. GRA

N80-20444# Sydney Univ. (Australia). Civil Engineering Labs.
WEB DISTORTION AND FLEXURAL-TORSIONAL BUCKLING
Gregory J. Hancock, Mark A. Bradford, and Nicholas S. Trahair Jun. 1979 29 p refs
(PB80-116221; R-349) Avail: NTIS HC A03/MF A01 CSCL 13M

In an I-section member with a slender, unstiffened web, a combined buckling mode may occur in which the web distorts and reduces the member's torsional resistance, and consequently its resistance to lateral (or flexural-torsional) buckling. An approximate analysis of the effect of web distortion on the elastic flexural-torsional buckling of a simply supported I-section member is presented. This analysis leads to a closed form interaction equation, relating the critical uniform moment and axial load acting on the member. The buckling moments and loads determined from this equation are compared with the results of a more sophisticated finite strip analysis, and are shown to be of high accuracy. The effects of different member cross sections on distortional buckling are investigated. GRA

N80-20445# Sydney Univ. (Australia). Civil Engineering Labs.
ASSESSMENT OF ENVIRONMENTAL WIND CONDITIONS BY WIND TUNNEL MODEL STUDIES
K. C. S. Kwok May 1979 40 p refs
(PB80-115926; R-348) Avail: NTIS HC A03/MF A01 CSCL 13M

The acceptance criteria for environmental wind conditions used in wind tunnel model tests for building developments are

discussed. These criteria are compared with other published criteria and shown to be in good agreement. The techniques used in conducting these wind tunnel model tests and the probabilistic technique used in the assessment of the prospective environmental wind conditions are discussed. GRA

N80-20446# Auburn Univ., Ala. Dept. of Civil Engineering.
STATISTICAL INVESTIGATION OF PAVEMENT SKID RESISTANCE DATA Final Report
R. K. Moore and C. M. Ford Jun. 1979 239 p refs Prepared in cooperation with the Federal Highway Admin., Washington, D.C. and sponsored in part by Alabama State Highway Dept. (PB80-116114; HPR-89; FHWA/RD-79-S0910) Avail: NTIS HC A11/MF A01 CSCL 13B

Regression analysis was used, with skid number data (2490 cases) measured on the Southern By-Pass (U.S. Highway 80) in Montgomery, Alabama, from 1969 to 1975, to develop equations that predict skid number and skid number ratio. The independent variables included service time, traffic, elapsed time since last rainfall, rainfall amount, aggregate type, aggregate mixture, calendar month, and air temperature at time of test. Logarithmic transformations were also used, but the regression models developed were not satisfactory for prediction purposes as indicated by the coefficient of multiple determination (r squared) and the standard error of estimate. GRA

N80-20447# Sydney Univ. (Australia). Civil Engineering Labs.
ANALYSIS OF THE CONSOLIDATION OF LAYERED SOILS USING THE METHOD OF LINES
J. C. Small and J. R. Booker Mar. 1979 36 p refs
(PB80-112766; R-342) Avail: NTIS HC A03/MF A01 CSCL 08M

The consolidation of a cross anisotropic horizontally layered soil is analyzed using a method in which the solution is decomposed into its Fourier components for plane strain and Fourier-Bessel components for axial symmetry. The method has distinct computational advantages over the usual finite element approach and leads to the significant computational savings and has the added advantage that it may be easily implemented on the minicomputer. GRA

32 COMMUNICATIONS

Includes land and global communications, communications theory, and optical communications.

For related information see also 04 Aircraft Communications and Navigation and 17 Spacecraft Communications, Command and Tracking.

N80-20448* National Aeronautics and Space Administration. Pasadena Office, Calif.
SATELLITE PERSONAL COMMUNICATIONS SYSTEM Patent
Norman B. Reilly (JPL) and Joel G. Smith, inventors (to NASA) (JPL) Issued 19 Feb. 1980 9 p Filed 30 May 1978 Supersedes N78-25275 (6 - 16, p 2101) Sponsored by NASA
(NASA-Case-NPO-14480-1; US-Patent-4,189,675; US-Patent-Appl-SN-910707; US-Patent-Class-325-4; US-Patent-Class-325-8; US-Patent-Class-325-9; US-Patent-Class-325-14) Avail: US Patent and Trademark Office CSCL 17B

Voice channel communication between low power mobile stations dispersed over a large area is provided by a system which includes a geostationary satellite utilizing a large UHF antenna that can receive a transmission from a caller and retransmit it over any one beam of a matrix of narrow beams, so the chosen beam covers an area in which a designated called party is located. A single up-link control channel occupying a narrow frequency band, can be utilized to receive dial up signals from a caller, and another single down link control channel can be utilized to ring up the called party located anywhere within the continental United States. The satellite antenna includes a matrix of feed horns that not only direct the beams in a controlled matrix onto the area of the continental United States, but also permit detection of the region from which the caller's signal is transmitted and the region from which the called party's answer is received, to enable the interconnection of signals received from these two regions. The system is particularly useful for rural areas.
Official Gazette of the U.S. Patent and Trademark Office

N80-20449 British Library Lending Div., Boston Spa (England).
DIGITAL PHASE METHOD OF FORMING SINGLE SIDE-BAND SIGNALS
Wojciech Stepniewski and Hubert Trzaska Oct. 1979 23 p refs Transl. into ENGLISH from Prace Inst. Lacznosci (Poland), 1977 p 29-41
(BLL-RTS-11857) Avail: British Library Lending Div., Boston Spa, Engl.

The deficiencies of previous methods of forming single sideband signals are defined and the advantages of using a system which can be tuned over a wide range of frequencies are discussed. Hitherto, it was impossible to construct such a system due to the lack of phase shifters which produce a stable phase shift of + or - pi/2 over a wide range of frequencies. It is proposed to use phase shifters based on flip-flop multivibrators for this purpose. The possibility is also presented of using the harmonics of a balanced mixer supplied with high frequency current of rectangular form. J.M.S.

N80-20450 Dartmouth Coll., Hanover, N.H.
SUBSTORM-RELATED VLF CHORUS EVENTS: LOCAL-TIME DEPENDENCE AND RELATIONSHIP TO NEWLY-INJECTED CLOUDS OF DRIFTING ENERGETIC ELECTRONS Ph.D. Thesis
Trevor William Thomas 1979 253 p
Avail: Univ. Microfilms Order No. 7921597

VLF chorus, a naturally occurring, electromagnetic wave phenomenon generated in the Earth's magnetosphere during interactions between VLF waves and energetic electrons was studied. The macrostructure of a 9 day period of VLF ground station data, recorded at two antarctic stations was studied using compressed time scale spectrograms. A magnetically quiet period was chosen for analysis, within which isolated substorms occurred. It was found that chorus frequently occurs in events, the most characteristic feature of which is an initial rise in the upper cut off frequency of the chorus band. Two interpretations of the chorus events were investigated based on the time dependence theory. The first model suggests that the observed rise in frequency is due to an inward convection of a bunch of electrons under a substorm enhanced westward electric field. The second model suggests that the dispersion is responsible for the time evolution of the events. Dissert. Abstr.

N80-20451 Michigan State Univ., East Lansing.
THEORETICAL AND EXPERIMENTAL STUDY OF THE PROXIMITY EFFECTS OF THIN-WIRE ANTENNA IN PRESSURE OF BIOLOGICAL BODIES Ph.D. Thesis
Khalid Karimullah 1979 159 p
Avail: Univ. Microfilms Order No. 8006140

The electromagnetic coupling caused by placing a biological body in the vicinity of a radiating antenna was studied. A numerical solution to the above mentioned problem is presented and the current distribution on the antenna and the induced electric fields inside the biological body are quantified. Experiments were conducted using a plexiglass container of suitable dimensions filled with saline solution to represent the biological body. Perturbation of input impedance from its free space value is plotted as a function of distance of separation between antenna and the body. Dissert. Abstr.

N80-20452 Michigan State Univ., East Lansing.
INDUCED ELECTROMAGNETIC FIELDS IN CONDUCTING BODIES IRRADIATED BY MAGNETIC FIELDS AND MICROWAVES Ph.D. Thesis
Jen-Hwang Lee 1979 248 p
Avail: Univ. Microfilms Order No. 8006149

A theoretical method for determining the eddy current induced by a uniform RF magnetic field or a beam of RF magnetic field in a biological body is developed. The body of rotational symmetry is subdivided into a number of circular rings with various radii and cross sectional areas. The eddy current induced by the impressed magnetic field is considered, physically, as induced

by a circulatory impressed electric field associated with the uniform impressed magnetic field. The eddy current is the product of the complex conductivity and the induced electric field. Using these relations and the point matching method, a set of simultaneous equations for the induced electric fields is obtained. A numerical method for quantifying the induced EM field on the surface of an irradiated biological body based on two coupled, surface integral equations is also developed. Dissert. Abstr.

N80-20453*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MEMORY-BASED FRAME SYNCHRONIZER Patent Application
James K. Niswander and Raymond J. Stattel, inventors (to NASA) Filed 12 Mar. 1980 23 p
(NASA-Case-GSC-12430-1; US-Patent-Appl-SN-129779) Avail: NTIS HC A02/MF A01 CSCL 17B

The memory frame synchronizer is comprised of a serial to parallel converter to convert a serial input data stream to a constantly changing parallel data output. This provides a data format which can be easily and dynamically changed. The process is accomplished using programmable memory arrays to perform the functions of the sync word recognizer and of the counter decoding logic. The parallel data output is supplied to programmable sync word recognizers each consisting of multiplexer and random access memory (RAM). The multiplexer is connected to both the parallel data output and an address bus. The RAM is used as an associative memory or decoder and is programmed with the pattern of binary 1's and 0's necessary to identify a specific sync word. NASA

N80-20454# University of Southern California, Los Angeles. Image Processing Inst.
IMAGE UNDERSTANDING RESEARCH Semiannual Technical Report, 1 Apr. - 30 Sep. 1979
Ramakant Nevatia and Alexander A. Sawchuk 30 Sep. 1979 153 p refs
(Contract F33615-76-C-1203; ARPA Order 3119)
(AD-A078034; USCIPI-910) Avail: NTIS HC A08/MF A01 CSCL 05/8

This technical report summarizes the image understanding and smart sensor research activities. The research program has, as its primary purpose, the development of techniques and systems for understanding images. Methodologies range from low level image processing principles, smart sensor CCD LSI circuit design, up to higher level symbolic representations and relational structure manipulation. GRA

N80-20455# Martin Marietta Aerospace, Orlando, Fla.
MULTIENVIRONMENT ACTIVE RF SEEKER TEST AND EVALUATION PROGRAM, MARFS TEST Final Report, 9 Jan. 1978 - 30 Sep. 1979
Sep. 1979 50 p refs
(Contract DAAK40-78-C-0046)
(AD-A078161; OR-15764) Avail: NTIS HC A03/MF A01 CSCL 17/7

The MARFS seeker is a 17 GHz circularly-polarized 10 watt pulsed solid-state seeker employing polarization agility, monopulse tracking, and polarization diverse signal processing. It was determined, at that time, that extensive tower and captive flight tests would be required to establish the usefulness of this particular seeker design and to collect data enabling further developments of detection and tracking algorithms. This report describes the support provided during these tests. It lists the tests supported, the alterations made, the maintenance performed, and the additional problems that were encountered. GRA

N80-20456# Illinois Univ. at Urbana-Champaign. Electromagnetics Lab.
INVESTIGATION OF TRANSFORM TECHNIQUES FOR SOLVING ELECTROMAGNETIC RADIATION AND SCATTERING PROBLEMS
R. Mittra, S. W. Lee, and W. L. Ko Dec. 1979 96 p refs
(Contract N00014-75-C-0293)
(AD-A077895; UIEL-79-13; UILU-ENG-79-2560) Avail: NTIS HC A05/MF A01 CSCL 20/3

In this project, we attack electromagnetic scattering and the diffraction problems by using a spectral domain formulation, which generally yields accurate results in a numerically efficient manner. Several published papers are attached in which the research was supported by this project. GRA

N80-20457# New Mexico Univ., Albuquerque. Dept. of Electrical Engineering and Computer Science.
CALCULATION OF THE SINGULARITY EXPANSION METHOD PARAMETERS FROM THE TRANSIENT RESPONSE OF A THIN WIRE Final Report
Kah-Song Cho and J. T. Cordaro Sep. 1979 80 p refs
(Grant AF-AFOSR-3723-78)
(AD-A078852; EE-264(79)AFOSR-723-1; AFOSR-79-1306TR) Avail: NTIS HC A05/MF A01 CSCL 20/3

The problem of determining the singularity expansion method SEM parameters from transient thin-wire data is examined. A computer code is used to generate response data. The SEM parameters are computed from these data. For noisy data, it is shown that the parameter values can be improved by signal averaging. GRA

N80-20458# TRW Defense and Space Systems Group, Redondo Beach, Calif.
FINITE ELEMENT APPLICATION TO TRANSIENT SCATTERING PROBLEMS Final Report, Jan. 1978 - Oct. 1979
A. Sankar and T. C. Tong 31 Oct. 1979 131 p refs
(Contract F49620-78-C-0049; AF Proj. 2301)
(AD-A078682; TRW-79-002-AFOSR; AFOSR-79-1302TR) Avail: NTIS HC A07/MF A01 CSCL 20/3

Finite element method is applied to compute the induced current distributions on arbitrarily-oriented thin wire in the time domain due to arbitrary pulses. The required mathematical equations and computer code are developed. The predictions by this method compare very well with other techniques. Advantages of this approach are mentioned. GRA

N80-20459# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.
A STANDARDIZATION EVALUATION POTENTIAL STUDY OF THE COMMON MULTI-MODE RADAR PROGRAM Final Report, Jan. - Sep. 1979
J. Gregory Jolda and Janine L. Thomas Nov. 1979 193 p refs
(AF Proj. 2003)
(AD-A079678; AFAL-TR-79-1195) Avail: NTIS HC A09/MF A01 CSCL 17/9

The cost impact of standardization as applied to Air Force avionic systems is discussed in this report. Several life-cycle cost estimates were made on the ASD Common Multi-Mode Radar program using the Standardization Evaluation Program (STEP) model. Costs for development, operation, and support of a common (standard) radar system are compared with like costs estimated for using individually developed radar systems across applicable aircraft. The STEP model is described, the Common Multi-Mode Radar program is discussed, and the STEP model application to this radar program is documented. STEP estimates project life-cycle costs of unique radar systems to be twice those of a common radar system. Results are discussed in terms of STEP runs and ASD costing estimates, and STEP model use is described. GRA

N80-20460# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
CHARACTERIZATION OF NONSTATIONARY CLUTTER Phase Report, 15 Jun. - 30 Sep. 1978
Donald J. Lewinski Griffiss AFB, N.Y. RADC Nov. 1979 45 p refs
(Contract F30602-78-C-0120; AF Proj. 4506)
(AD-A079655; RADC-TR-79-267) Avail: NTIS HC A03/MF A01 CSCL 17/9

A mathematical model for nonstationary and/or nonhomogeneous clutter is proposed and developed. The first order probability density function of the clutter power is treated as the expected value of a conditional density which is a function of random parameters. General expressions are derived and selected plots are given for Nakagami conditional density functions with mean values which have the following distributions: uniform, gamma, log uniform and log normal. It is seen that the limiting behavior of all the considered cases is similar. GRA

N80-20461# Harry Diamond Labs., Adelphi, Md.
NEAR-MILLIMETER WAVE TECHNOLOGY BASE STUDY. VOLUME 1: PROPAGATION AND TARGET/BACKGROUND CHARACTERISTICS
Stanley M. Kulpa Nov. 1979 157 p refs
(DA Proj. 1L1-61102-AH-44)
(AD-A079620; HDL-SR-79-8-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 17/9

This study is a comprehensive summary of the Near-Millimeter Wave (100 to 1000 GHz) technology base and its potential applications. The state of the art is reviewed, and technology gaps are identified. Volume 1 contains the results of that portion of the Study devoted to the analysis of various factors influencing atmospheric propagation and target/background signatures. Comparison is made between theoretical predictions and limited experimental data in several key areas. Topics discussed include clear air absorption, the effects of atmospheric particulates (rain, fog, clouds, etc.) turbulence, measurement techniques, and the signature characteristics of a variety of targets and backgrounds at near-millimeter (NMM) wavelengths. A summary is given of research thrusts which would be useful in establishing a more reliable data base for evaluating near-millimeter wave systems applications. Also included is a list of facilities and organizations actively involved in this technology, plus a comprehensive reference list of current and historical literature pertinent to the material in this volume. GRA

N80-20462# Ohio State Univ., Columbus. ElectroScience Lab.
BASIC RESEARCH IN THREE-DIMENSIONAL IMAGING FROM TRANSIENT RADAR SCATTERING SIGNATURES Final Report, 1 Jul. 1977 - 31 Mar. 1979
Jonathan D. Young Jun. 1979 62 p refs
(Contract DASG60-77-C-0133)
(AD-A079423; ESL-784785-5) Avail: NTIS HC A04/MF A01 CSCL 17/9

The transient radar scattering signatures of a set of cone-like objects were studied, and techniques for creation of images using these signatures were investigated. The signatures were obtained from model measurements on two coherent 10:1 bandwidth complex scattering cross-section measurement systems. Ramp response signatures were generated from the measured data, and their relationship to target geometrical characteristics were analyzed. Two techniques for imaging from the signatures gathered at near nose-on look angles were investigated: Limiting Surface Imaging and Physical Optics Inverse Diffraction. Useful images, with some loss of detail, were produced. GRA

N80-20463# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
A VARIATIONAL APPROXIMATION FOR SCATTERING OF SCALAR WAVES BY STOCHASTIC SURFACES
E. P. Gray, R. W. Hart, and R. A. Farrell Jul. 1979 119 p
(Contract N00024-78-C-5384)
(AD-A077066; APL/JHU-TG-1322) Avail: NTIS HC A06/MF A01 CSCL 20/14

A variational method is developed for the scattering of scalar waves by statistically rough surfaces. It provides a procedure for recasting other approximations so that errors cancel to first order, and also yields a quantity that is indicative of the quality of the approximation. The method is tested by application to a corrugated surface for which some exact solutions are known. Scattering from stochastically rough surfaces continues to be of importance in many areas, but analytical difficulties generally preclude obtaining an exact solution to significant problems. Accordingly, various approximation methods are used. Since no quantitative index of approximation quality is generally available, there is often doubt not only as to which method is best but even whether any available one is adequate. GRA

N80-20464# Illinois Univ. at Urbana-Champaign. Coordinated Science Lab.
ON CORRELATION PARAMETERS FOR SOME BINARY SEQUENCES OF LENGTHS 31 AND 63 FOR SPREAD-SPECTRUM MULTIPLE-ACCESS COMMUNICATIONS M.S. Thesis
David William Haguma Gahutu May 1979 141 p refs
(Contracts DAAB07-72-C-0259; DAAG29-78-C-0016; Grants DAAG29-78-G-0114; NSF ENG-78-06630)
(AD-A077152; UILU-ENG-78-2238; R-845) Avail: NTIS HC A07/MF A01 CSCL 17/2

The correlation parameters of some binary sequences of lengths 31 and 63 for spread-spectrum multiple-access (SSMA) communication are evaluated. The peak correlation parameters are the key parameters needed to determine the worst interference at any of the correlation receivers in a SSMA communications system due to the presence of other users and the multipath signals. These peak correlation parameters are readily obtained from the correlation data presented in this thesis. The performances of some new and old candidate sieves for optimal binary sequence phases are compared. When the number of binary sequences required exceeds the number in one set of a given family, one option is to use two or more sets of sequences from the family. This motivated the evaluation of the peak cross-correlation between two different sets of Gold sequences of length 31. Finally, the mean-square partial correlation parameters of some binary periodic sequences are computed. GRA

N80-20465# Northeastern Univ., Boston, Mass.
SIGNAL PROCESSING CIRCUIT DEVELOPMENT Final Technical Report, 22 Dec. 1976 - 21 Mar. 1977
Basil L. Cochrun Griffiss AFB, N.Y. RADC Nov. 1979 52 p refs
(Contract F19628-77-C-0087)
(AD-A079053; RADC-TR-79-262) Avail: NTIS HC A04/MF A01 CSCL 17/5

This report covers the modification of an Air Force owned IR-CCD scanning system for one dimensional scans. The modifications provide electronic instrumentation for two dimensional scanning and horizontal and vertical sweep circuitry for video display. GRA

N80-20466# Utah Univ., Salt Lake City. Dept. of Computer Science.
NOISE SUPPRESSION METHODS FOR ROBUST SPEECH PROCESSING Semiannual Technical Report, 1 Apr. - 30 Sep. 1979
Steven F. Boll, Dennis Pulsipher, and H. Ravindra Oct. 1979 70 p refs Sponsored in part by DARPA
(Contract N00173-73-C-0045; ARPA Order 3301)
(AD-A079321; UTEC-CSC-79-163) Avail: NTIS HC A04/MF A01 CSCL 17/2

Robust speech processing in practical operating environments requires effective environmental and processor noise suppression. This report describes the technical findings and accomplishments during this reporting period for the research program funded to develop real-time, compressed speech analysis-synthesis algorithms whose performance is invariant under signal contamination. Fulfillment of this requirement is necessary to insure reliable secure compressed speech transmission within realistic military command and control environments. Overall contributions resulting from this research program include the understanding of how environmental noise degrades narrow band, coded speech, development of appropriate real time noise suppression algorithms, and development of speech parameter identification methods that consider signal contamination as a fundamental element in the estimation process. This report describes the current research and results in the areas of noise suppression using the dual input adaptive noise cancellation using the LMS and gradient lattice algorithms, to spectral analysis and synthesis using the constant-Q transform, articulation rate change techniques, analytic continuation of band limited signals or signal extrapolation, and two-dimensional automatic gain control. GRA

N80-20467# Montana State Univ., Bozeman.
AN ANALYSIS OF PLASTIC SHOCK WAVES IN SNOW
Robert L. Brown Nov. 1979 21 p refs
(Contract DAAG29-78-G-0089; DA Proj. 4A1-61102-AT-24)
(AD-A080051; CRREL-79-29) Avail: NTIS HC A02/MF A01 CSCL 08/12

An analytical study of the propagation of shock waves in snow was carried out to evaluate the response of medium density snow to high rates of loading. One solution was developed for steady shock waves; this resulted in calculation of pressure jump, density jump and stress wave speed. Correlation with available

experimental data was found to be good. Nonsteady shock waves were also considered in order to evaluate wave attenuation rates in snow. Very few data were available to compare with the analytical results, so no definite conclusions on the part of the study could be made. The results show, however, that shock waves that produce plastic deformation attenuate at extremely high rates and that differences in pressure between two waves are quickly eliminated within a short distance. Calculations were also made to evaluate the effect of wave frequency on attenuation rates. The results show that for plastic waves, frequency is not a predominant factor for determining attenuation rates. GRA

N80-20468# Illinois Univ. at Chicago Circle, Chicago. Dept. of Materials Engineering.
WAVE PROPAGATION IN THREE-DIMENSIONAL INELASTIC MEDIA Final Report, 26 Jan. 1976 - 15 Sep. 1979
T. C. T. Ting Dec. 1979 9 p refs
(Grant DAAG29-76-G-0121)
(AD-A080081; ARO-13157.3-E) Avail: NTIS HC A02/MF A01 CSCL 20/4

The research supported by the Army grant was to study some aspects of three dimensional waves in inelastic media. Inelastic media include elastic-plastic materials and viscoelastic solids. This report contains a summary of the results obtained from this investigation. GRA

N80-20469# RAND Corp., Santa Monica, Calif.
TRANSIENT RESPONSE OF A HETERODYNE RECEIVER: IMPLICATIONS FOR A TIME-OF-ARRIVAL SYSTEM Interim Report
Thomas Finley Burke Nov. 1979 226 p
(Contract F49620-77-C-0023)
(AD-A078373; RAND/R-2418-AF) Avail: NTIS HC A11/MF A01 CSCL 17/3

A directional antenna is a filter whose response varies with direction. A modulated signal transmitted from such an antenna produces different farfield waveforms in all directions (except for possible symmetry). The response of a receiver to the transmission will vary with position in the antenna pattern of the emitter. This effect is ordinarily negligible but it could limit the ultimate performance of any system that accepts off-axis signals and relies upon the details of waveform. In a leading-edge TOA system used to determine the location of a pulsed emitter, the several receivers necessarily lie at different angular positions from the emitter. This analysis indicates that in a simple, idealized TOA system that would otherwise be entirely free from error, the waveform effect arising from a directional emitter can lead to errors of several dozen meters in the computed location. GRA

N80-20470# Rome Air Development Center, Griffiss AFB, N.Y.
EXPERIMENTAL IMAGE COMPRESSION SUBSYSTEM (EICS) COMMUNICATION TESTING Progress Report, Mar. - Jun. 1979
Anthony R. Fanelli Sep. 1979 30 p
(AF Proj. 6244)
(AD-A077546; RADC-TR-79-261) Avail: NTIS HC A03/MF A01 CSCL 17/2

The Experimental Image Compression System (EICS) was developed to effectively transmit intelligence and reconnaissance image data over narrowband links in minimum time. This report covers testing accomplished on the EICS. Testing was conducted over actual communications circuits in real time, with the most significant being the Troposcatter and Microwave links. GRA

N80-20471# Armed Forces Communications and Electronics Association, Eatontown, N. J.
THE ART OF COMMUNICATIONS INTERFACES: TECHNOLOGY INSERTION IN THE C3I ARENA: PROCEEDINGS OF THE 4TH ANNUAL SEMINAR Final Report
Bernard D. DeMarinis (Booz-Allen and Hamilton, Inc., Tinton Falls, N.J.) Nov. 1979 154 p Seminar held at Eatontown, N.J., 14-15 Nov. 1979
(AD-A078344; AFCEA-FM-4) Avail: NTIS HC A08/MF A01 CSCL 17/2

Several papers by leading authorities on the design, application, and logistical support of Very High Speed Integrated Circuitry (VHSIC) in communications systems that are emerging in the newly developed state-of-the-art and are being fielded are presented for discussion. The impact of VHSIC on new communications equipments and systems is presented by proponents from the U.S. Army's Electronics Research and Development Command (ERADCOM), the Communications Research and Development Command (CORADCOM), and Communications Electronics Materiel Readiness Command (CERCOM). In addition, three papers from industrial proponents on VHSIC design, application, and support are given. GRA

N80-20472# Bendix Corp., Baltimore, Md. Communication Div.
SAMPLING DIGITAL MULTIPLE CHANNEL SAME FREQUENCY REPEATER STUDY Final Report, Aug. 1978 - Apr. 1979
William F. Lawrence and William F. Kruszewski Wright-Patterson AFB, Ohio AFAL Jun. 1979 70 p refs
(Contract F33615-78-C-1457; AF Proj. 7662)
(AD-A078817; AFAL-TR-79-1078) Avail: NTIS HC A04/MF A01 CSCL 17/2

The feasibility of modifying an AN/ZRC-1 multiple single frequency repeater was investigated. The present design used an analog sampling scheme to allow the simultaneous repeating of up to four separate analog voice radio links, using only one frequency per link. It was found that this scheme did not lend itself to wideband digital signals such as those found with the TSEC/KY-58 voice encryption equipment. Instead, a new approach is described which would provide a sampling single frequency repeater for wideband digital signals. GRA

N80-20473# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A NOTE ON ALMOST NOISELESS CHANNELS
Barney Reiffen 4 Oct. 1979 20 p Presented at the 1979 IEEE Intern. Symp. on Inform. Theory, Grignano, Italy, 25-29 Jun. 1979
(Contract F19628-80-C-0002; AF Proj. 649L)
(AD-A077588; TN-1979-66) Avail: NTIS HC A02/MF A01 CSCL 17/2

An 'almost noiseless' channel is defined. The definition corresponds to many physical channels operating at high signal-to-noise ratio. Attention is focused on the decrement in capacity and computation cutoff rate as the noise increases from zero. It is shown that the decrement in R(comp) is dominated by a term proportional to the square root of the noisiest transition probability, alpha, to a nominally noiseless output. In contrast, the decrement in C in many cases of interest is dominated by a term proportional to -(alpha)ln(alpha). Accordingly the decrement in R(comp) can significantly exceed the decrement in C. This paper was presented at the 1979 IEEE International Symposium on Information Theory held in Grignano, Italy on 25-29 June 1979. GRA

N80-20474# SRI International Corp., Menlo Park, Calif.
A MODEL OF NATURAL HF RADIO NOISE IN SEVERELY DISTURBED PROPAGATION ENVIRONMENTS Topical Report, 17 Nov. 1977 - 31 Mar. 1979
Gary H. Price and Georgellen Smith 31 Mar. 1979 32 p refs
(Contract DNA001-77-C-0063; DNA Proj. S99-QAXH)
(AD-A077619; AD-E300627; DNA-4930T) Avail: NTIS HC A03/MF A01 CSCL 17/2

A model is developed that describes the impact of severe propagation losses on the natural noise environment at high frequencies. GRA

N80-20475# Lincoln Lab., Mass. Inst. of Tech., Lexington.
MILLSTONE HILL RADIO STAR CALIBRATION
W. L. Oliver Aug. 1979 86 p refs
(Contract F19628-78-C-0002)
(AD-A079037; STK-103; ESD-TR-79-217) Avail: NTIS HC A05/MF A01 CSCL 17/9

A comprehensive analyses of all radio-star calibration measurements made since May 1975 with the Millstone Hill Tracking Antenna is described. No evidence is found to indicate that mechanical offsets in the antenna structure have changed during this period. Previous suspicions that such changes might be continually occurring are shown to have arisen from acute mathematical correlation ambiguities encountered in fitting models to the monthly results. In addition, it is found that the high

stability of the LED-type encoders installed in November 1977 has virtually eliminated this last source long-term variation in pointing offset. Only known mechanical modifications, causing discrete changes in pointing error model, have caused the pointing-error model to change since this date. Calibration of the octagonal rail/cam-follower system used by the Tracking Antennas as an off-axis azimuth encoder system is also investigated. Evidence is presented that the primary pointing errors that arise from inaccuracies in this system are due to an offset between the azimuth axis and the geometric center of the rail octagon, an ellipticity of the tower perimeter upon which the rails are mounted, and a slight bowing of the rails, the center offset being an estimated 0.3 mm, the rail geometry being 0.05 mm out of round, and the rails being bowed a maximum of 0.02 mm from straightness. These deficiencies cause pointing errors on the order of 10 mdeg. GRA

N80-20478# Lister Hill National Center for Biomedical Communications, Bethesda, Md.
BIOMEDICAL COMMUNICATIONS EXPERIMENTS. USING THE COMMUNICATIONS TECHNOLOGY SATELLITE: TECHNICAL EVALUATION Final Report
George R. Thoma Aug. 1979 100 p refs
(PB80-111016; LHNCBC-79-13) Avail: NTIS HC A05/MF A01 CSCL 17B

The objectives, method, and conclusions of a Technical Evaluation of the Public Health Services network consisting of six small Earth terminals linked via the Communications Technology Satellites are documented. The technical performance of the networks is evaluated in terms of channel quality, system capability availability, equipment maintainability, and its capability for broad geographical coverage, channel sharing, and digital transmission. Causes for deficiencies observed in performance are indentified and corrective measures discussed. GRA

N80-20477# National Bureau of Standards, Washington, D.C. National Engineering Lab.
CHARACTERIZATION OF ELECTRICAL IGNITION SOURCES WITHIN TELEVISION RECEIVERS Final Report
George J. Rogers and David D. Evans Oct. 1979 64 p refs
Sponsored in part by Consumer Product Safety Commission, Washington, D.C.
(PB80-103450; NBS-TN-1109) Avail: NTIS HC A04/MF A01 CSCL 17B

The ignition of television receivers initiated by electrical failures in the circuitry was examined by studying four receivers. Selected locations within the circuitry were stressed by introducing full or partial short circuits to simulate the failure of electronic components. The temperatures and increased power dissipation generated by short-circuited components were recorded. Although component temperatures greater than 500 C were achieved, no flaming ignition sources were generated. GRA

N80-20478# National Technical Information Service, Springfield, Va.
TROPOSPHERIC SCATTER COMMUNICATIONS. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Jul. 1979
William E. Reed Jul. 1979 223 p Supersedes NTIS/PS-78/0718; NTIS/PS-77/0625; NTIS/PS-76/0553; NTIS/PS-75/459
(NTIS/PS-79/0750/4; NTIS/PS-78/0718; NTIS/PS-77/0625; NTIS/PS-76/0553; NTIS/PS-75/459) Avail: NTIS HC $28.00/MF $28.00 CSCL 17B

The research covers data transmission, multiplexing, digital, and microwave systems and equipment. Studies on troposcatter propagation are included. Federally sponsored research as well as some foreign reports are included in the citations. This updated bibliography contains 214 abstracts, 11 of which are new entries to the previous edition. GRA

N80-20479# Federal Communications Commission, Washington, D. C. Policy Development Div.
SPEECH BANDWIDTH REDUCTION Final Report
John B. ONeal, Jr. (North Carolina State Univ., Raleigh) and Philip B. Gieseler Aug. 1979 29 p refs
(PB80-103955; FCC/PRB/PD-79/02) Avail: NTIS HC A03/MF A01 CSCL 17B

The current state-of-the-art in techniques for reducing the bandwidth needed to represent the human voice waveform is reviewed. If techniques exist for significantly reducing the 3 KHz bandwidth while maintaining sufficient quality, the radio frequency bandwidth could be proportionately reduced. The status of speech baseband compression is still in the laboratory stage or just emerging. None of it has been applied in any large commercial operation. Technology is available for reducing the 3 KHz voice bandwidth by a factor of 10, but at this stage this technology is not useful because a desirable level of performance and cost have not been achieved. The basic conclusion is that techniques currently available for significantly reducing speech bandwidth produce a concomitant degradation in speech quality. GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N80-20480 British Library Lending Div., Boston Spa (England).
SOLID-STATE AMPLIFIERS AND IMAGE CONVERTERS
N. I. Krasnikov and S. V. Svechnikov Oct. 1979 25 p refs Transl. into ENGLISH from Poluprovodnikovaya Tekhnika 1 Mikroelektronika (Kiev), v. 7, no. 7, 1972, p 17-27
(BLL-RTS-11799) Avail: British Library Lending Div., Boston Spa, Engl.

A technology assessment of solid state amplifiers and image converters is presented. R.E.S.

N80-20481 British Library Lending Div., Boston Spa (England).
A NORMAL YOKE FOR THE DETERMINATION OF THE MAGNETIC CHARACTERISTICS OF ELECTRICAL SHEETS
Alfred Fiebiger Oct. 1979 115 p refs Transl. into ENGLISH of Ein Normaljochzur Bestimmung der Magnetischen Kenngrossen von Elektroblechen (Brunswick), Bericht E-6, Physikalisch-Technische Bundesanstalt, Dec. 1976 115 p
(BLL-RTS-11946; Ber-E-6; ISSN-0341-6674) Avail: British Library Lending Div., Boston Spa, Engl.

The standardization of test procedures to determine the true magnetic properties of electrical steel sheets is discussed. A number of test methods which are based upon the magnetic properties of electrical steel sheets, according to their final industrial application, are described. The use of the steel sheets in magnetic circuits is discussed and the magnetic properties of the electrical steel sheets usually determined by two measured variables are reviewed. A.W.H.

N80-20482 Stanford Univ., Calif.
LUMP PARTITIONING OF INTEGRATED-CIRCUIT BIPOLAR TRANSISTOR MODELS FOR HIGH-FREQUENCY APPLICATIONS Ph.D. Thesis
Nelson Nai-Hin Chan 1979 214 p
Avail: Univ. Microfilms Order No. 8006299

A two lump high frequency model was derived using the lump partitioning technique for an integrated bipolar transistor over a frequency range up to f sub T and a full current range. Excellent agreement between model and measured S parameters was obtained for the Stanford Bipolar Transistors with an f sub T of 500 MHz. A physical basis was provided for the two lump model. There are two major physical mechanisms responsible for the high frequency behavior of the integrated bipolar transistors. For low currents it is the AC crowding effect which causes more current flow in the periphery of the emitter area than in the center. For high currents it is the sidewall transistor action which induces a significant amount of minority charge that controls the high frequency response of the device. The combination of these two effects provide a guide to partition the one lump model into two sections, one section with most of the ac response and the other section with only dc response. Dissert. Abstr.

N80-20483 Purdue Univ., Lafayette, Ind.
METAL-INSULATOR-SEMICONDUCTOR ASPECTS OF MONOLITHIC ZINC OXIDE SURFACE ACOUSTIC WAVE STRUCTURES Ph.D. Thesis
Michael Edwin Cornell 1979 270 p
Avail: Univ. Microfilms Order No. 8005849

The nonideal electrical behavior of the metal ZnO SiO2 Si(MZOS) configuration constitutes an important factor in the performance of monolithic ZnO SAW devices. The observations described herein emphasize the use of MIS measurements to study the electrical properties of the MZOS system. The major areas of investigation involved process induced damage to the Si-SiO2 subsystem and electronic charge injection/trapping within the ZnO films. A procedure whereby the charge distribution is established as a quasi time independent distribution is described. Comparison studies of the C-V characteristics of the MZOS-C and Si-SiO2 system, a ZnO etch back experiment, and capacitance time observation of the change injection phenomena are examined. A model is advanced based upon the physical nature of the piezoelectric ZnO films to explain charge injection and the dipole formation within the ZnO film. Dissert. Abstr.

N80-20484 Marquette Univ., Milwaukee, Wis.
THEORY AND APPLICATIONS OF NEGATIVE DIFFERENTIAL RESISTANCE IN THE CURRENT-VOLTAGE CHARACTERISTICS OF METAL-INSULATOR-METAL DIODES Ph.D. Thesis
David M. Drury 1978 171 p
Avail: Univ. Microfilms Order No. 8006526

The negative differential resistance phenomenon that has been observed in the current-voltage characteristics of some MIM diodes was investigated theoretically. Deficiencies of the present theory purporting to explain this phenomenon were pointed out. A theory was developed to explain the observed negative differential resistance. According to this theory, if the diode bias voltage is sufficiently large, an electron can tunnel inelastically through the insulating layer of the diode by emitting a surface plasmon that propagates in the insulating layer. The mathematical analysis of the proposed stimulated inelastic tunneling theory was performed using an idealized two dimensional model of an MIM diode. The electric and magnetic field distributions of the surface plasma wave in the diode's insulating layer were derived and used to obtain the interaction Hamiltonian of the tunneling electrons. Second order time-dependent perturbation theory was used to obtain the stimulated inelastic tunneling rate. An equation relating the inelastic tunneling current to the bias voltage was obtained. Dissert. Abstr.

N80-20485 New York Univ., N. Y.
AN ACQUISITION AID FOR A PHASE LOCKED LOOP Ph.D. Thesis
Donald Richard Ucci 1979 286 p
Avail: Univ. Microfilms Order No. 8006478

A method for acquisition of a phase lock loop receiver is presented. A structure designed for this purpose is described. The method uses an iterative technique to estimate the frequency of an unknown Doppler shifted unmodulated carrier signal imbedded in noise. The acquisition process can be achieved even if the system is below threshold. The acquisition times for a given probability of error are presented for two modes of operation - one which provides a reduced acquisition time but requires more hardware complexity, and another which produces slightly less reduced acquisition times but a simpler hardware design. Results for a hardware implementation are presented. Dissert. Abstr.

N80-20486 Stanford Univ., Calif.
PLACEMENT AND ROUTING ALGORITHMS FOR HIERARCHICAL INTEGRATED CIRCUIT LAYOUT Ph.D. Thesis
Bryan Thomas Preas 1979 210 p
Avail: Univ. Microfilms Order No. 8006344

Algorithms for the automatic layout of custom integrated circuits were developed. These algorithms are suitable for the design of very large scale integrated circuits. Hierarchical decomposition is used to reduce the circuit complexity to the level that it can be comprehended by the designer. At each level of the hierarchy, the layout problem consists of the placement and interconnection of rectangular blocks of arbitrary size and shape. The layout is modelled using graph theoretical methods. The problem is broken down into two major sub-problems: placement and routing. Placement consists of a constructive initial placement followed by iterative improvement. The interconnection or routing process first finds a general layout topology for the interconnection nets and then a detailed routing using constructive and iterative improvement methods. The algorithm minimizes layout area and assures 100% routing completion. Dissert. Abstr.

N80-20487* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CATALYST SURFACES FOR THE CHROMOUS/CHROMIC REDOX COUPLE Patent
Jose D. Giner (Giner, Inc.) and Kathleen J. Cahill, inventor (to NASA) (Giner, Inc.) Issued 11 Mar. 1980 8 p Filed 29 Nov. 1978 Supersedes N79-14538 (17 - 05, p 0618) Sponsored by NASA
(NASA-Case-LEW-13148-1; US-Patent-4,192,910; US-Patent-Appl-SN-964754; US-Patent-Class-429-101; US-Patent-Class-429-105; US-Patent-Class-429-107; US-Patent-Class-429-109) Avail: US Patent and Trademark Office CSCL 09A

An electricity producing cell of the reduction-oxidation (REDOX) type is described. The cell is divided into two compartments by a membrane, each compartment containing a solid inert electrode. A ferrous/ferric couple in a chloride solution serves as a cathode fluid which is circulated through one of the compartments to produce a positive electric potential disposed therein. A chromic/chromous couple in a chloride solution serves as an anode fluid which is circulated through the second compartment to produce a negative potential on an electrode disposed therein. The electrode is an electrically conductive, inert material plated with copper, silver or gold. A thin layer of lead plates onto the copper, silver or gold layer when the cell is being charged, the lead ions being available from lead chloride which was added to the anode fluid. If the REDOX cell is then discharged, the current flows between the electrodes causing the lead to deplate from the negative electrode and the metal coating on the electrode will act as a catalyst to cause increased current density.
Official Gazette of the U.S. Patent and Trademark Office

N80-20488*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
APPARATUS FOR DAMPING OPERATOR INDUCED OSCILLATIONS OF A CONTROLLED SYSTEM Patent Application
John W. Edwards and John W. Smith, inventors (to NASA) Filed 29 Feb. 1980 24 p
(NASA-Case-FRC-11041-1; US-Patent-Appl-SN-126064) Avail: NTIS HC A02/MF A01 CSCL 09C

The invention relates to an adaptive filter for suppressing operator induced oscillations of a control system such as a pilot controlled aircraft or spacecraft. The novelty of the invention is in the filter arrangements which effectively estimate frequency and amplitude to produce a signal that will provide damping without rate limiting. NASA

N80-20489# Syracuse Univ., N. Y.
MEASUREMENT OF ELECTRICAL CONDUCTIVITY IN CARBON/EPOXY COMPOSITE MATERIAL OVER THE FREQUENCY RANGE 75 MHz TO 2.0 GHz Phase Report, 1 Oct. 1977 - 31 Dec. 1978
W. F. Walker and Roger E. Heintz Oct. 1979 58 p refs Prepared in cooperation with Rochester Inst. of Technology, N.Y.
(Contract F30602-76-C-0121; AF Proj. 2338) (AD-A078008; RADC-TR-79-255) Avail: NTIS HC A04/MF A01 CSCL 09/3

A stripline technique for the measurement of longitudinal and transverse conductivity of graphite (carbon)/epoxy composite materials over the VHF/UHF (75 MHz to 2.0 GHz) range is described. The method is unusual in that it is essentially free of the uncertain effects of contact resistance between the sample and the measurement apparatus. The underlying theory of the method rests on the relationship between the conductivity of the sample and the lossy standing wave patterns established on the strip transmission line. The method accommodates a range

of sample conductivities from 100 mhos/m. (e.g. transverse carbon/epoxy) to aluminum (approx. 10 to the 7th power mhos/m). Actual measurements were made from 75 MHz to 2 GHz. The method itself should be usable from 50 MHz to 4 GHz. GRA

N80-20490# Varian Associates, Palo Alto, Calif.
MULTIBAND KLYSTRON STUDY Final Report, 31 Mar. 1978 - 30 Jun. 1979
A. D. Lanue Oct. 1979 61 p
(Contract F30602-78-C-0124; AF Proj. 4506)
(AD-A078036; RADC-TR-79-248) Avail: NTIS HC A04/MF A01 CSCL 09/5

The present study indicates that a reasonable interspersed S-Band and C-Band computer cavity broadband multiband klystron is feasible. Computer results suggest a 10 percent operating bandwidth at S-Band and a 5 percent operating band at C-Band. Author (GRA)

N80-20491# Varian Associates, Palo Alto, Calif. Microwave Tube Div.
HIGH POWER MILLIMETER WAVE AMPLIFIER Interim Report, 1 Nov. 1978 - 30 Apr. 1979
S. Heggi, Howard Jory, R. Morwood, A. Nordquist, and R. Symons Sep. 1979 34 p refs Sponsored in part by Ballistic Missile Defense, Advanced Technol. Center
(Contract F30602-78-C-0011; ARPA Order 3192; AF Proj. 192C)
(AD-A078007; RADC-TR-79-235; IR-3) Avail: NTIS HC A03/MF A01 CSCL 09/5

This report contains the results of the testing of rebuilt Gyro-TWT. This rebuilt tube incorporates an extra length of interaction circuit. The rebuilt tube achieved a small signal gain of 17db and was prone to oscillations. The Gyro-TWT was rebuilt a second time and included, among other improvements, rf loss on the interaction circuit. The results of the initial cold test on this tube are included. Also included in this report are further calculations on TE Gyro-TWT's operating in the fundamental and the second harmonic using a small signal dispersion relation computer program. GRA

N80-20492# Naval Ocean Research and Development Activity, Bay St. Louis, Miss. Oceanographic Lab.
THERMISTOR ARRAY IMPEDANCE CONSIDERATIONS
Clifford R. Holland Jun. 1978 17 p refs
(AD-A079886; NORDA-TN-26) Avail: NTIS HC A02/MF A01 CSCL 09/1

This study examines the effects of cable resistance changes on temperature measurement accuracy when using a typical thermistor array for ocean temperature measurements. The analysis demonstrates that while some of the effects can be calculated or calibrated out, the major effects of insulation leakage can not be so corrected. Depending on choice of thermistor, measurement errors as large as a few deg Celsius are possible, with errors of a few tenths of a deg Celsius likely. Even with great care, errors of a few hundredths of a degree Celsius are probable. To avoid sensitivity to cable impedance changes, it is strongly recommended that appropriate signal conditioning electronics be utilized at the thermistor sensor. The use of signal conversion and line driving electronics will insure that the accuracy of measured parameters will be maximally preserved during transmission to the output end of the array. GRA

N80-20493# Analysis and Computer Systems, Inc., Burlington, Mass.
DEVELOPMENT OF NUMERICAL TECHNIQUES AND COMPUTER SYSTEMS FOR DESIGN, ANALYSIS AND FABRICATION OF INTERDIGITAL TRANSDUCERS AS SURFACE ACOUSTIC WAVE DEVICES Final Technical Report, 24 May 1976 - 31 Mar. 1978
Lawrence J. Elterman Griffis AFB, N.Y. RADC Aug. 1979 301 p
(Contracts F19628-76-C-0257; F19628-78-C-0028; AF Proj. 2305; AF Proj. 4600)
(AD-A079623; RADC-TR-79-181) Avail: NTIS HC A14/MF A01 CSCL 17/1

Computerized, mathematical and analytical techniques were developed, refined and applied to the description, analysis and synthesis of surface acoustic wave (SAW) transduction structures and devices. Efficient mapping techniques between the various description mathematical models and techniques in support of electron beam fabrication of SAW interdigital transducers were developed and refined. A number of computer programs were completed ranging in complexity and size from modifications to existing programs, to design and development of complex analytical techniques utilizing numerical control methodology. GRA

N80-20494# University of Southern California, Los Angeles. Electronic Sciences Lab.
EVALUATION OF GALLIUM NITRIDE FOR ACTIVE MICROWAVE DEVICES Annual Report, Oct. 1978 - Sep. 1979
M. Gershenzon Oct. 1979 21 p
(Contract N00014-75-C-0295; RR0210203)
(AD-A079319;) Avail: NTIS HC A02/MF A01 CSCL 07/4

Planar single crystal layers of GaN that are almost defect free and completely transparent can now be grown routinely by CVD on basal plane sapphire substrates. The native shallow donor density still remains high (ten to the 18th power - ten to the 19th power/cc) unaltered by growth under varying Ga:N ratios, but decreasing somewhat with increased growth rate. The results of growth under N2 at high pressures are inconclusive at present. Doping with Ge or C during growth does not compensate the donor. Low temperature photoluminescence studies of proton implanted samples and of samples grown in the absence of H2 provide additional evidence that the shallow donor is not associated with H. Work is in progress to interpret much fine structure observed in the luminescence spectra, to complete the identification and characterization of donors and acceptors introduced by ion implantation and to observe any effects on the native donor density caused by the implantation of Ga and of N. GRA

N80-20495# Missouri Univ. -Rolla.
ION IMPLANTATION IN PEROVSKITE TYPE FERROELECTRICS Final Progress Report, 1 Nov. 1976 - 31 Oct. 1979
Robert Gerson 20 Dec. 1979 15 p refs
(Grant DAAG29-77-G-0001)
(AD-A080078; ARO-14313.1-P) Avail: NTIS HC A02/MF A01 CSCL 07/4

The object of this work was to study ion implantation in perovskite ferroelectrics and to investigate the conductive behavior of implanted layers. Implantation experiments were carried out on strontium titanate, barium titanate (single crystal and ceramic), titanium dioxide (rutile), lithium niobate, and lithium tantalate. Ion beams attempted were H(+), B(+), C(+), N(+), Fe(+), Ar(+), As(+), Ta(+), and Nb(++). In general the most effective ion in producing conductivity was boron, B(+). Significant conductivity was measured in the substrates above, except for single crystals of barium titanate and lithium tantalate. Boron implanted in strontium titanate and subsequently annealed resulted in highly conductive layers, whose sheet resistance could be between 100 and 100,000 ohm per square. The charge carrier mobility in this system was 5 sq. cm/volt sec at room temperature, increasing to 100 sq. cm/volt sec at 77 K. Implantation doses were 10 to the 16th power to 10 to the 17th power ions/sq. cm. The implantation depth, as revealed by chemical stripping experiments, was about 500 nm. A conductive anomaly was measured in some samples at 105 K, the cubic-tetragonal transition temperature. GRA

N80-20496# TRW Defense and Space Systems Group, Redondo Beach, Calif.
GaAs ANALOG INTEGRATED CIRCUITS (GaAs RF-LSI), PHASE 1. VOLUME 2: APPENDICES Progress Report, 5 Jun. 1978 - 5 Jun. 1979
Aug. 1979 151 p refs
(Contract N00039-78-C-0305)
(AD-A079589) Avail: NTIS HC A08/MF A01 CSCL 09/5

The derivation of the field effect transistor modeling code is explained and the program listing is presented. Supplementary processing data are included with supporting analysis and data for the analog multiplier designs. A.R.H.

N80-20497# TRW Defense and Space Systems Group, Redondo Beach, Calif.
GaAs ANALOG INTEGRATED CIRCUITS (GaAs RF-LSI), VOLUME 1 Technical Progress Report, 5 Jun. 1978 - 5 Jun. 1979
Aug. 1979 185 p refs
(Contract N00039-78-C-0305)
(AD-A079588) Avail: NTIS HC A09/MF A01 CSCL 09/5

The overall objective of the GaAs RF-LSI Development Program is the development of a family of monolithic GaAs analog integrated circuits operating at frequencies through X-band, and the implementation of a monolithic X-band receiver which combines a number of these building block circuits. The aim of the first phase effort was to amass the analysis, design, and process technology tools with which to implement the building block circuits and later the receiver. The general objective of Phase 1, Device, Process and Circuit Techniques Investigation, was to undertake the device and process technology development necessary to support the Phase 2, MSI Building Block Development. Closely coupled with the actual process development were theoretical studies addressing optimization of devices and circuit techniques for monolithic implementation. The following is a brief task by task summary of the work accomplished. The sections which follow this introduction are expanded discussions of each of the tasks. GRA

N80-20498# Kentucky Univ., Lexington. Dept. of Electrical Engineering.
ON THE PHYSICAL REALIZABILITY OF BROAD-BAND EQUIVALENT CIRCUITS FOR WIRE LOOP AND DIPOLE ANTENNAS Interim Report, 1 Sep. 1977 - 31 May 1979
Gary W. Streable and L. Wilson Pearson May 1979 163 p refs
(Grant AF-AFOSR-3452-77; AF Proj. 2301)
(AD-A079961; RR-79-1; AFOSR-80-0003TR) Avail: NTIS HC A08/MF A01 CSCL 20/14

Results of a study of the feasibility of using Singularity Expansion Method (SEM) data to synthesize broad-band equivalent circuits for loop and wire structures are reported. The positive realness of admittances derived are studied, on the basis of both pole-pair groupings and eigenmode groups within the SEM formalism. Synthesized circuits are given for a center-driven and a quarter-driven straight wire antenna, and for a circular loop. Results are compared with those derived by means of numerical solution of the time-dependent integral equations for each structure. The sensitivities of the response to changes in the values of poles and to circuit element values are considered. GRA

N80-20499# Kentucky Univ., Lexington. Dept. of Electrical Engineering.
ON THE PHYSICAL REALIZABILITY OF BROADBAND LUMPED-PARAMETER EQUIVALENT CIRCUITS FOR ENERGY-COLLECTING STRUCTURES Final Report
L. Wilson Pearson (Mississippi Univ., University) and Donald R. Wilton Jul. 1979 44 p refs
(Grant AF-AFOSR-3452-77)
(AD-A079962; RR-79-2; AFOSR-80-0004TR) Avail: NTIS HC A03/MF A01 CSCL 20/14

The practical implementation of equivalent circuits which represent the energy delivered to an arbitrary load impedance by an antenna or a port on a scatterer is discussed. Particular attention is paid to the positive-real function issues associated with the equivalent admittance of the structure when evolved from the point of view of the Singularity Expansion Method. A proof is given which establishes that the admittances associated with current eigenmode contributions to the total current are individually positive-real functions. An ad hoc approach to approximating these admittances with simpler pole-pair positive-real admittances is given for high-Q structures. A brief survey of the applicable circuit synthesis algorithms and their features is provided. Some fundamental considerations in the implementation of the sources representing the energy coupled from the incident wave are presented. GRA

N80-20500# Stanford Univ., Calif. Integrated Circuits Lab.
FABRICATION, CHARACTERIZATION AND OPTIMIZATION OF POSFET (PVF2-SILICON) PIEZOELECTRIC TRANSDUCERS FOR LOW FREQUENCY 100 Hz TO 500 KHz UNDERWATER ACOUSTIC APPLICATIONS Final Report, 1 Jul. 1978 - 31 Aug. 1979
James D. Plummer Oct. 1979 90 p refs
(Contract N00014-78-C-0614)
(AD-A079113; TR-FR-DPG582) Avail: NTIS HC A05/MF A01 CSCL 17/1

PVF2 is a new organic polymer piezoelectric material. Its unique features include an acoustic impedance closely matched to liquid environments, linearity to a broad range of input signals, wide bandwidth and mechanical strength and flexibility. In comparison with commonly used ceramic piezoelectric materials, PVF2 has a lower electromechanical coupling coefficient, a lower dielectric constant and higher dielectric losses at frequencies greater than or equal to 500 KHz. Because of these different material properties, system applications of PVF2 require different trade-offs than the ceramic materials. This report describes an investigation, both theoretical and experimental, of the potential applications of PVF2 in low frequency (100 Hz-500 KHz) underwater sound applications. Both reception and transmission of sound are considered and the experimental performance of several types of PVF2 and integrated silicon/PVF2 transducers are described. GRA

N80-20501# Ames Lab., Iowa.
FABRICATION OF SUPERCONDUCTING WIRE COMPOSITES BY DIRECTIONAL SOLIDIFICATION
J. D. Verhoeven, E. D. Gibson, D. Finnemore, J. Ostensen, and L. Goodrich Jun. 1979 48 p refs
(Contract W-7405-eng-82)
(IS-4698) Avail: NTIS HC A03/MF A01

Processes were developed for the fabrication of composite superconducting wire using directional solidification and chill casting techniques. The superconducting properties were comparable to commercial superconducting wire. DOE

N80-20502# California Inst. of Tech., Pasadena. W. M. Keck Lab. of Engineering Materials.
INFLUENCE OF MAGNETIC ORDERING ON THE SUPERCONDUCTING PROPERTIES OF AMORPHOUS (Zr/SUB 1-X/Er/SUB X/)3Rh ALLOYS
W. L. Johnson Aug. 1979 21 p refs
(Contract EY-76-C-03-0822)
(CALT-822-110; DOE-TR-97) Avail: NTIS HC A02/MF A01

The effect of Er impurities on the superconducting properties of an amorphous Zr3Rh alloy was studied. The Er impurities were foundt o exhibit mangnetic behavior characteristic of a free Er(3+) ion in a weak crystal field. Magnetic ordering of the Er moments was observed to occur at a temperature T/sub M/ which is proportional to the Er concentration. This ordering strongly influenced superconductivity as evidenced by anomalous behavior in the concentration dependence of T/sub c/. For concentrations near the critical Abrikosov-Gorkov value superconductivity appeared to be induced by magnetic ordering. The superconducting critical field H/sub c2/(T) was strongly effected by magnetic ordering and could be used to deduce information concerning the nature of the ordering. The results are analyzed in terms of theoretical models. DOE

N80-20503# Bendix Corp., Kansas City, Mo.
PRODUCTION OF THIN FILM NETWORKS WHICH UTILIZE CHROME-GOLD CONDUCTORS
D. A. Rathbun Jul. 1979 8 p Presented at the ISHM Conf., Los Angeles, 13 Nov. 1979
(Contract EY-76-C-04-0613)
(BDX-613-2257; CONF-791113-3) Avail: NTIS HC A02/MF A01

Many thin film networks (TFNs), designed and manufactured for DOE programs utilize gold films 3 to 9 microns thick evaporated over a chromium film. The chromium film is evaporated over sputtered tantalum nitride film, and the substrate material is 0.027 in. (0.686 mm) thick alumina. The TFNs must have high film adhesion characteristics, meet high bondability requirements, and allow stable electrical parameters. Various production techniques ensure these high reliability TFNs. DOE

N80-20504# General Electric Co., St. Petersburg, Fla. Neutron Devices Dept.

DETERMINING THE MODE OF HIGH VOLTAGE BREAKDOWNS IN VACUUM DEVICES
H. C. Miller, E. J. Furno, and J. P. Sturtz 1979 22 p refs
(Contract EY-76-C-04-0656)
(GEPP-OP-469) Avail: NTIS HC A02/MF A01

Photography, recording of the voltage waveform, and monitoring of the X-ray output were used to investigate breakdown in vacuum. Results indicate that breakdowns may be divided into two types: vacuum (interelectrode) breakdown - characterized by a diffuse moderately bright discharge, a relatively slow and smooth voltage collapse and a large burst of X-rays; and surface (insulator) flashover - characterized by a bright discharge with a very bright filamentary core, a relatively fast and noisy voltage collapse, and no X-ray burst. Thus, the results indicate that useful information concerning the type of breakdown in a vacuum device can be obtained by monitoring the voltage (current) waveforms and the X-ray output. DOE

N80-20505# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
MULTIPLE PROPERTY VARIATIONS IN COAXIAL CYLINDRICAL CONDUCTORS DETERMINED WITH MULTIPLE-FREQUENCY EDDY CURRENTS
W. E. Deeds and C. V. Dodds Nov. 1979 63 p refs
(Contract W-7405-eng-26)
(NUREG-CR-0967; ORNL/NUREG/TM-335) Avail: NTIS HC A04/MF A01

To expedite and automate the taking of readings, computer programs were written that take simultaneous measurements of the magnitude and phase of the output voltage from an eddy current pickup at several different frequencies on standards with known properties. Empirical formulas are then constructed from powers of various possible functions of the magnitude and phase readings, and the formulas are fitted to the desired properties of the material by a least-squares process. Finally, the empirical formulas are used with readings on unknown samples to determine their properties. The computer programs, written in FORTRAN, are especially designed to be used with coils coaxial with multiple layers of cylindrical conductors, possibly containing defects. However, the instrument calibrating, data taking, and formula fitting parts of the programs are actually applicable to any configuration of coils and conductors. DOE

N80-20506# National Bureau of Standards, Washington, D.C. Electron Devices Div.
MEASUREMENT TECHNIQUES FOR HIGH POWER SEMICONDUCTOR MATERIALS AND DEVICES Annual Report, 1 Oct. 1977 - 30 Sep. 1978
Oct. 1979 144 p refs
(DOE/RA-0041; NBSIR-79-1756) Avail: NTIS HC A07/MF A01

Results of research directed toward the development of measurement methods for semiconductor materials and devices which will lead to more effective use of high-power semiconductor devices in applications for energy generation, transmission, conversion, and conservation are reported. Emphasis is on the development of measurement methods for materials for thyristors and rectifier diodes. The use of thermally stimulated current and capacitance measurements and other deep level measurement techniques developed as a means for characterizing lifetime-controlling or leakage source defects in power grade silicon material and devices are described. Procedures to enable spreading resistance measurements of thyristor starting material and layer profiles to be made on a reliable basis are included. DOE

N80-20507# Gould, Inc., Spring House, Pa.
SUPERCONDUCTING FAULT CURRENT LIMITER Quarterly Technical Progress Report, 8 Aug. - 7 Nov. 1978
1979 104 p refs
(Contract ET-78-C-01-3015)
(CONS/3015-T1; QTPR-1) Avail: NTIS HC A06/MF A01

The suitability of using a superconducting fault current limiter (SCFCL) in conjunction with other superconducting apparatus or transmission lines was investigated. Literature search, consultation, analysis, and experimentation were carried out to derive a set of operational parameters for a SCFCL and to answer key questions as to the feasibility of a superconducting element to meet these performance objectives. Substantial progress was made on several of these program tasks. A comprehensive search of the literature on SCFCL devices and applications was initiated; the references which were obtained to date are evaluated within a framework into which additional references can be added as they are received. Device analyses were also started in order to determine to what extent the various proposed SCFCL devices meet the requirements of the power system. DOE

N80-20508# Sandia Labs., Albuquerque, N. Mex.
MICROSTRUCTURAL STUDIES OF THICK FILM RESISTORS USING TRANSMISSION ELECTRON MICROSCOPY
T. V. Nordstrom and C. R. Hills 1979 14 p refs Presented at the ISHM Conf., Los Angeles, 13 Nov. 1979
(Contract EY-76-C-04-0789)
(SAND-79-0387C; CONF-791113-4) Avail: NTIS HC A02/MF A01

The microstructure of thick film resistors of the DuPont 1400 series fired on 96% Al2O3 at 850 C was charscterized using transmission electron microscopy. Samples were prepared by a combination of precision grinding and ion milling. Each sample was examined for crystallinity, phase morphology, particle size, elemental composition and phase identification. X-ray energy dispersive spectroscopy was used for elemental composition determination and electron diffraction for phase identification. Microstructure of the 1421 (100 omega/square) material is composed of lead ruthenate crystals in a lead silicate glass along with quartz crystals. For both resistors most crystallites are surrounded by the glassy phase. DOE

N80-20509# National Bureau of Standards, Washington, D.C. National Engineering Lab.
A 20 BIT PLUS SIGN, RELAY SWITCHED D/A CONVERTER
T. Michael Souders and Donald R. Flach Oct. 1979 25 p refs
(PB80-105331; NBS-TN-1105) Avail: NTIS HC A02/MF A01 CSCL 09E

A multirange, 20-bit + sign, voltage output d/a converter is described. The converter exhibits less than 1 ppm (of full scale range) linearly error, and temperature coefficients of gain, offset and linearly of less than 0.5 ppm/C. The design is based on the R-2R ladder network in the current steering mode, using miniature latching relays with mercury wetted contacts for switching. There are ten buffered temperature controlled unsaturated standard cells which comprise the voltage reference. Techniques with design details are presented for minimizing errors due to relay thermal emf's, for implementing a self calibration of linearity errors, and for obtaining optional coding formats. Calibration techniques are discussed and representative calibration data are presented. GRA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N80-20510 Engineering Sciences Data Unit, London (England).
FLUCTUATING RESPONSE OF CIRCULAR CYLINDERS IN SMALL GROUPS IN FLUID FLOW: DISCUSSION AND GUIDE TO DATA AVAILABLE
1979 41 p
(ESDU-79025; ISBN-0-85679-273-X) For information on availability of series, sub-series and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $770.50

The response of cylinders in small groups and methods of alleviating oscillation problems are examined. A brief description of the content of currently available sources of data is provided. The derived information can be used to assess the possibility of flow induced oscillation problems of, for example, a group of chimney stacks or a multiple pipe run in a chemical plant. This may apply to small groups of up to six to eight cylinders, but

excludes specific references to grouped cables or heat exchanger tube bundles. ESDU

N80-20511 Engineering Sciences Data Unit, London (England).
FLUID MECHANICS, INTERNAL FLOW SUB-SERIES. VOLUME 7: A GUIDE TO FAN SELECTION AND PERFORMANCE
1979 88 p
(ESDU-79037; ISBN-0-85679-286-1) Copyright. For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $770.50

Guidance is provided on the selection of suitable fan types for particular internal flow systems and data to assess their performance. The research may be used in the design and tendering for systems associated with air conditioning, cooling, ventilation, forced draughts, and wind tunnels. Information is given on the performance and selection of various types of axial-flow, centrifugal-flow, mixed-flow, and cross-flow fans including guidance on electric motors and noise. ESDU

N80-20512 Engineering Sciences Data Unit, London (England).
HEAT PIPES: PROPERTIES OF COMMON SMALL-PORE WICKS
1979 11 p
(ESDU-79013; ISBN-0-85679-257-8) For information on availability of series, sub-series and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $290.50

The effective thermal conductivity, the minimum capillary radius, and the permeability of commonly used heat pipe wicks are examined. The data apply to the following types of wick: annular screens, screen covered grooves, multiple screens, plain or sintered spherical particles, and sintered felted metal fibers. ESDU

N80-20513 Virginia Univ., Charlottesville.
DYNAMICS OF FLEXIBLE ROTORS PARTIALLY FILLED WITH A VISCOUS INCOMPRESSIBLE FLUID Ph.D. Thesis
Scott Lynn Hendricks 1979 125 p
Avail: Univ. Microfilms Order No. 8004603

A linear theory is developed to study the motion of a hollow circular cylinder rotating with constant angular velocity and partially filled with a viscous incompressible fluid. A two-dimensional theory which ignores axial motion in the fluid is discussed. This theory exhibits all of the essential features of liquid-rotor coupling and is used to analyze a simple rotor configuration, and explore the ramifications of the analysis. The full three dimensional theory is then developed and used to analyze more complicated rotors. The results of the analysis predict that over a range of operating speeds, the rotor-fluid system is unstable. The extent of this unstable region is determined by the system parameters. The interplay between the viscosity of the fluid and damping on the rotor is especially important in determining stability boundaries. Dissert. Abstr.

N80-20514 Illinois Univ. at Chicago Circle, Chicago.
EXPERIMENTAL AND THEORETICAL INVESTIGATIONS OF HEAT TRANSFER BETWEEN A GAS-SOLID FLUIDIZED BED AND IMMERSED TUBES Ph.D. Thesis
Nanak Singh Grewal 1979 350 p
Avail: Univ. Microfilms Order No. 8007460

The heat transfer coefficient between an electrically heated single horizontal tube and a 0.305 m square air-solid fluidized beds of glass beads, dolomite, sand, silicon carbide and alumina particles. The effect of particle size, shape, density, and specific heat; air mass fluidizing velocity; tube size; tube material; bed depth, heat flux and distributor design on heat transfer rate is investigated. Dissert. Abstr.

N80-20515 Minnesota Univ., Minneapolis.
SOLUTION OF THE EQUATIONS OF CONVECTIVE HEAT, MASS, AND MOMENTUM TRANSFER BY THE FINITE-ELEMENT METHOD USING QUADRILATERAL ELEMENTS Ph.D. Thesis
Satish Ramadhyani 1979 196 p
Avail: Univ. Microfilms Order No. 8006668

A finite element procedure was developed that overcomes the Reynolds number limitation. The procedure involved the use of the weighted residual technique with a special shape function that accounted or the influence of the convective terms in the governing conservation equations. The procedure was developed in detail for two dimensional flow situations, but the ease of extension to three dimensional flow situations was a significant consideration in its development. This has dictated the use of quadrilateral elements rather than the otherwise simpler triangular elements, since the three dimensional counterpart of a quadrilateral was hexahedron. Hexahedral blocks were employed to fill an arbitrary three dimensional domain more easily than did tetrahedra. Dissert. Abstr.

N80-20516 Michigan State Univ., East Lansing.
FLUID FLOW THROUGH A PARTIALLY FILLED CYLINDER Ph.D. Thesis
Raymond Nicholas Greenwell 1979 90 p
Avail: Univ. Microfilms Order No. 8006121

The laminar flow of viscous incompressible fluid through a partially filled circular cylinder is studied. For this problem the Navier-Stokes equations can be transformed into Laplace's equation, and the region of solution is the interior of two intersecting circles. The region is mapped to the unit circle by a conformal transformation, so that the problem may be solved by the Poisson integral formula. It is found that the flow rate can be increased by as much as 27.3% by not filling the cylinder all the way. For the case where the region of solution is the interior of two circles intersecting at right angles, the computations simplify and the integration can be performed analytically. For the case of the nearly-half filled cylinder, a perturbation method is used on the solution of the half filled circular cylinder. The results obtained from these special cases agree with the previously obtained results. Dissert. Abstr.

N80-20517 Minnesota Univ., Minneapolis.
NONGEOSTROPHIC BAROCLINIC INSTABILITY OF TWO FLUIDS Ph.D. Thesis
James Theodore Bradford 1979 197 p
Avail: Univ. Microfilms Order No. 8006588

The interfacial stability of two fluids under differential rotation in a tall, right circular cylinder was investigated. The differential speeds are such that the Rossby number of the flow is small. Geostrophic conditions prevail in the interior, undisturbed flow and the results of interfacial shape calculations using the geostrophic velocity profiles in each fluid are compared with experimentally measured interface shapes. A linearized stability analysis, including interfacial tension and viscous effects at the interface and end caps was performed on the nongeostrophic equations of motion. Experiments were conducted in which instability regions corresponding to the wave numbers n = 1 and n = 2 are determined. Qualitative observations are made concerning the presence of amplitude and frequency vacillations characteristic of finite amplitude baroclinic waves under supercritical conditions. Dissert. Abstr.

N80-20518 Purdue Univ., Lafayette, Ind.
LABORATORY STUDY OF THERMAL AND FLOW STRUCTURES IN HEATED AND/OR COOLED LAYERS OF WATER Ph.D. Thesis
Massoud Behnia 1979 235 p
Avail: Univ. Microfilms Order No. 8005833

The basic internal transport processes in natural waters and the interactions at the air-water interface was investigated. To this end, thermal and flow structure in a stratified layer of water heated by a radiation source and/or cooled by forced air flow over the surface was studied in the laboratory. Accurate temperature measurements were obtained using a Mach-Zehnder interferometer which did not disturb or distort the temperature, radiation and flow fields. The flow structure was studied qualitatively by visualizing the patterns with dye injection, particle tracing (fish scales) and shadowgraph techniques. Temperature fluctuations and thermal plume activities were detected by a thermistor. Dissert. Abstr.

N80-20519 California Inst. of Tech., Pasadena.
CAVITATION INDUCED INSTABILITIES ASSOCIATED WITH TURBOMACHINES Ph.D. Thesis
David Miner Braisted 1980 196 p
Avail: Univ. Microfilms Order No. 8006277

A linear stability analysis was developed which was based upon the understanding that auto-oscillation is a function of the entire hydraulic system including the cavitating inducer. Using the experimentally obtained transfer functions of two impellers, the analysis successfully predicted both the onset and frequency of auto-oscillation. The stability of the dynamic pump test facility is significantly reduced by the increased dynamically active character of the inducers at the lower cavitation number. In addition, the stability of the dynamic pump test facility was found to be particularly sensitive to the mass flow gain factor and pump impedance. Dissert. Abstr.

N80-20520 Virginia Polytechnic Inst. and State Univ., Blacksburg.
THE DYNAMICS OF AN ULTRASONIC CAVITATION BUBBLE Ph.D. Thesis
Chinenyenwa Okereke 1979 175 p
Avail: Univ. Microfilms Order No. 8005225

The dynamics of the bubble are represented by a problem in partial differential equations, the governing equations of which are the continuity equation and the Navier-Stokes equation for a compressible liquid. A finite difference scheme was developed for generating the exact solution of the problem. It was not possible to obtain a solution that would satisfy both the governing equations and all the boundary conditions. The problem has more boundary conditions in pressure than can be satisfied. Consequently, it is not a valid mathematical statement and is not a legitimate representation of the dynamic behavior of the cavitation bubble. Dissert. Abstr.

N80-20521 Minnesota Univ., Minneapolis.
DEVELOPMENT AND APPLICATIONS OF A LAMELLAR MODEL FOR ANALYSIS OF LIQUID-LIQUID MIXING Ph.D. Thesis
Julio Mario Ottino 1979 230 p
Avail: Univ. Microfilms Order No. 8006659

Mixing, a process that involves fluid mechanics, diffusion, and chemical reactions is analyzed. In general, these three mechanisms govern reaction in any reacting mixture. These mechanisms are integrated in a common frame of description. Analysis is divided in two parts: a continuum description of the mechanical mixing of fluids (with neither diffusion nor reaction) and a lamellar mixing model for mixing of diffusing and reacting fluids. Mechanical mixing of fluids is interpreted as deformation of contact interfaces or material surfaces and is described by continuum mechanical arguments. Mixing of diffusion and reacting fluids is interpreted in terms of a lamellar model. This is a continuum, deterministic description based on a Lagrangian point of view for computation of interactions between local fluid motion, diffusion, and chemical reaction. The attributes of each model are delineated. Dissert. Abstr.

N80-20522 Purdue Univ., Lafayette, Ind.
A CONTRIBUTION TO THE STABILITY OF ELECTRICALLY CONDUCTING BOUSSINESQ FLUIDS BY THE ENERGY METHOD Ph.D. Thesis
Alan Morris Greenburg 1979 100 p
Avail: Univ. Microfilms Order No. 8005885

The energy method of Reynolds and Orr, for flows subject to finite disturbances, is extended to include approximate base flows and flows in which inertial and/or Lorentz forces of the base flow are of comparable or greater magnitude than the impressed body force field. The extension given is consistent with the well-known Boussinesq approximation. Two new stability criteria were established which demonstrate the effect of allowing approximate base flows. The universal stability boundary considers only the extremal characteristics of the base flow. The optimal stability boundary criteria applies variational techniques and utilizes more details of the base flow to obtain the largest possible stability region consistent with the theory. The theory is applied to the problem of heated Couette flow, both with and without internal viscous heating. Dissert. Abstr.

N80-20523 Stanford Univ., Calif.
EVOLUTION OF TURBULENCE BY THREE-DIMENSIONAL NUMERICAL PARTICLE-VORTEX TRACING Ph.D. Thesis
Benoit Couet 1979 145 p
Avail: Univ. Microfilms Order No. 8006306

A method for the numerical simulation of three dimensional incompressible flows is described which traces the motion of the vortex filaments in the velocity field which these filaments create. Three computational experiments were pursued in three dimensional space. The velocity of translation of a single vortex ring was measured and compared with the Biot-Savart law. The agreement was excellent. Next, the evolution in time of an infinite periodic array of closed vortex filaments was studied. The results were compared with those obtained previously by the spectral method. The Fourier mode spectra were in very good agreement. The third simulation followed a mixing layer from an initial state of uniform vorticity with two and three dimensional small perturbations. Streamwise perturbations lead to the usual roll-up of vortex patterns with spanwise uniformity. Substantial streamwise vortex deformation and stretching is generated by the spanwise perturbations. Dissert. Abstr.

N80-20524 Stanford Univ., Calif.
KINEMATICS AND DYNAMICS OF VORTEX RINGS IN A TUBE Ph.D. Thesis
James Gordon Brasseur 1979 228 p
Avail: Univ. Microfilms Order No. 8006294

Kinematic theory and flow visualization experiments are combined to examine the dynamic processes which control the evolution of vortex rings from very low to very high Reynolds numbers, and assess the effects of the wall as a vortex ring travels up a tube. The vortex ring are modeled as a circular vortex filament axisymmetrically placed in an infinitely long tube. Using the Biot-Savart law, a kinematic expression which linearly relates a given distribution of vorticity to its velocity field, the closed form solutions to the nonsteady potential and streamline fields are obtained. Reynolds number relationships are established and quantitative differences among the three Reynolds number groups are discussed. Dissert. Abstr.

N80-20525 Oregon State Univ., Corvallis.
GAS FLOW IN FLUIDIZED BEDS OF LARGE PARTICLES: EXPERIMENT AND THEORY Ph.D. Thesis
Goran N. Jovanovic 1979 166 p
Avail: Univ. Microfilms Order No. 8007123

Gas mixing was studied in a fluidized bed which is 0.483 m by 0.127 m (19 in. by 5 in) in cross section and has transparent plexiglass panels on the front and back. Experiments were conducted in a bed with and without tube array. Sand and dolomite particles with mean particle diameter of 1.3 mm (0.051 in.) to 4.0 mm (0.157 in.) were used. Gas velocities varied from minimum fluidization velocity to an excess velocity of 2.5 m/s. Two large particle fluidization regimes are described and experimental evidence is presented in support of the existence of slow bubble and exploding bubble regimes. A semi-theoretical equation establishing the boundary between these two modes of fluidization is derived. A new model, called the meandering flow model, is proposed for gas flow through fluidized beds of large particles. The concept of meandering flow is developed on the basis of actual physical movements of gas. Dissert. Abstr.

N80-20526 Virginia Polytechnic Inst. and State Univ., Blacksburg.
PULSATILE LAMINAR FLOW SEPARATION IN AN EXPONENTIALLY DIVERGING TUBE Ph.D. Thesis
Frederick James Walburn 1979 142 p
Avail: Univ. Microfilms Order No. 8005230

A laser Doppler anemometer technique was developed and used to study steady and unsteady flow through rigid circular tubes. An experimental arrangement was presented which includes a design which significantly reduced beam refraction effects as the laser beams pass through the circular glass tube. A Tektronix 4051 data acquisition system was used to acquire the data, process it and display non-dimensional axial velocity profiles on a digital plotter. It was found in steady flow through a diverging circular channel that a threshold Reynolds number existed for which the flow separated initially at the furthest downstream end of the channel divergence. With increasing Reynolds number above threshold, the point of flow separation defined by Prandtl's criterion moved upstream, such that for any given axial location x sub i, there corresponded a characteristic Reynolds number at which the flow was completely separated downstream of x sub i. Upstream, the flow remained laminar and attached. Dissert. Abstr.

N80-20527*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

PROGRESS IN TURBULENCE MODELING FOR COMPLEX FLOW FIELDS INCLUDING EFFECTS OF COMPRESSIBILITY

David C. Wilcox (DCW Industries, Inc., Studio City, Calif.) and Morris W. Rubesin Washington Apr. 1980 73 p refs

(NASA-TP-1517; A-7916) Avail: NTIS HC A04/MF A01 CSCL 20D

Two second-order-closure turbulence models were devised that are suitable for predicting properties of complex turbulent flow fields in both incompressible and compressible fluids. One model is of the 'two-equation' variety in which closure is accomplished by introducing an eddy viscosity which depends on both a turbulent mixing energy and a dissipation rate per unit energy, that is, a specific dissipation rate. The other model is a 'Reynolds stress equation' (RSE) formulation in which all components of the Reynolds stress tensor and turbulent heat-flux vector are computed directly and are scaled by the specific dissipation rate. Computations based on these models are compared with measurements for the following flow fields: (a) low speed, high Reynolds number channel flows with plane strain or uniform shear; (b) equilibrium turbulent boundary layers with and without pressure gradients or effects of compressibility; and (c) flow over a convex surface with and without a pressure gradient. A.R.H.

N80-20528*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

CONTROLLED OVERSPRAY SPRAY NOZZLE Patent Application

Willibald P. Prasthofer, inventor (to NASA) Filed 29 Feb. 1980 16 p

(NASA-Case-MFS-25139-1; US-Patent-Appl-SN-126138) Avail: NTIS HC A02/MF A01 CSCL 20D

A nozzle for suppressing overspray of multiingredient ablative materials is described. The nozzle includes a cylindrical inlet which converges to a restricted throat. A curved juncture between the cylindrical inlet and the convergent portion, with a predetermined radius of curvature, affords unrestricted and uninterrupted flow of the ablative material. A divergent bell shaped chamber and an adjustable nozzle exit are utilized which provide a highly effective spray pattern for suppressing overspray to an acceptable level and producing a homogeneous jet of material that adheres well to the substrate. NASA

N80-20529*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va. Aerothermodynamics Branch.

COMPLETE SUPERSONIC FLOWFIELDS OVER BLUNT BODIES IN A GENERALIZED ORTHOGONAL COORDINATE SYSTEM Final Report

Peter A. Gnoffo 17 Sep. 1979 45 p refs Backup document for AIAA Synoptic scheduled for publication in AIAA Journal, May 1980

(NASA-TM-81784; Log-J11338) Avail: NTIS HC A03/MF A01 CSCL 20D

A general orthogonal coordinate system is used to describe various axisymmetric and two-dimensional shapes. Close approximations to planetary probe configurations are possible. The full Navier-Stokes equations are discretized in this coordinate system in a manner based on Allen and Cheng's numerical procedure. The blow shock is treated as a discontinuity which floats between grid points. Completely coupled flows over the forebody, base, and near wake were calculated over a cylinder, sphere, and an approximation to the Viking Aeroshell. Some problem areas in determining the base flow for increasing Reynolds number are discussed. In particular, it is found that the mean free path of the fluid near the wall immediately below the corner of the Viking Aeroshell, which experiences a severe expansion, can become greater than the local mesh size required to resolve the boundary layer in the forebody. R.E.S.

N80-20530# Montana State Univ., Bozeman. Mechanical Engineering Dept.

DETERMINATION OF FORCES ON ARBITRARY CONCAVE BODIES IN HIGH SPEED RAREFIED GASES

C. R. Wimberly 4 Dec. 1979 32 p refs Backup document for AIAA Synoptic scheduled for publication in AIAA Journal, Sep. - Oct. 1980

(Log-J11513) Avail: NTIS HC A03/MF A01

A method is presented for representing the forces imparted to general concave surfaces in high speed rarefied gases with variable accomodation at the surface and for a wide range of molecular speed ratios. A procedure previously developed for variations in momentum transfer is also presented that allows for predictions of coefficients from the free molecule flow through the transition regime to continuum flow. In the analysis, the molecules are assumed to obey Maxwell's velocity distribution law before and after collisions, reflecting directionally in a cosine distribution. The colliding molecules are assumed to have variable accomodation at the surface, where the surface temperature is uniform. The resulting general equations are then presented and applied to some simple concave bodies. Author

N80-20531*# General Electric Co., Lynn, Mass.

CALCULATION OF OBLIQUE-SHOCK-WAVE LAMINAR-BOUNDARY-LAYER INTERACTION ON A FLAT PLATE Final Report

Uriel Goldberg and Eli Reshotko Mar. 1980 87 p refs Prepared in cooperation with Case Western Reserve Univ., Cleveland

(Grant NGR-36-027-064)

(NASA-CR-159829) Avail: NTIS HC A05/MF A01 CSCL 20D

A finite difference solution to the problem of the interaction between an impinging oblique shock wave and the laminar boundary layer on a flat plate is presented. The boundary layer equations coupled with the Prandtl-Meyer relation for the external flow are used to calculate the flow field. A method for the calculation of the separated flow region is presented and discussed. Comparisons between this theory and the experimental results of other investigators show fairly good agreement. Results are presented for the case of a cooled wall with an oncoming flow at Mach number 2.0 without and with suction. The results show that a small amount of suction greatly reduces the extent of the separated region in the vicinity of the shock impingement location. M.G.

N80-20532*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FACTORS AFFECTING CLEANUP OF EXHAUST GASES FROM A PRESSURIZED, FLUIDIZED-BED COAL COMBUSTOR

R. James Rollbuhler and John A. Kobak Mar. 1980 37 p refs

(NASA-TM-81439; E-382) Avail: NTIS HC A03/MF A01 CSCL 20D

The cleanup of effluent gases from the fluidized-bed combustion of coal is examined. Testing conditions include the type and feed rate of the coal and the sulfur sorbent, the coal-sorbent ratio, the coal-combustion air ratio, the depth of the reactor fluidizing bed, and the technique used to physically remove fly ash from the reactor effluent gases. Tests reveal that the particulate loading matter in the effluent gases is a function not only of the reactor-bed surface gas velocity, but also of the type of coal being burnt and the time the bed is operating. At least 95 percent of the fly ash particules in the effluent gas are removed by using a gas-solids separator under controlled operating conditions. Gaseous pollutants in the effluent (nitrogen and sulfur oxides) are held within the proposed Federal limits by controlling the reactor operating conditions and the type and quantity of sorbent material. M.G.

N80-20533# Naval Postgraduate School, Monterey, Calif.

HOT WIRE ANEMOMETER INVESTIGATION OF TURBULENCE LEVELS AND DEVELOPMENT OF LIQUID CRYSTAL FLOW VISUALIZATION TECHNIQUES FOR THE RECTILINEAR CASCADE TEST FACILITY M.S. Thesis

William R. Miller Sep. 1979 63 p refs

(AD-A078284) Avail: NTIS HC A04/MF A01 CSCL 20/4

Using hot wire anemometry, a base line turbulence intensity level was determined for the Rectilinear Cascade at the U.S. Naval Postgraduate School Turbopropulsion Laboratory. The turbulence with straight inlet guide vanes was compared to the turbulence without guide vanes. Results indicated a uniform though slightly greater turbulence level when using guide vanes. The

use of liquid crystal thermography was investigated as a technique for visualizing flow across cascade test blades. Methods of applying crystals to and resistance heating of the blade surface were investigated in bench tests. Recommendations are made which should lead to the successful application of the technique in the cascade wind tunnel. GRA

N80-20534# Naval Postgraduate School, Monterey, Calif.
OSCILLATING FLOW ABOUT TUBE BUNDLES M.S. Thesis
Mehmet Ali Cinar Sep. 1979 122 p
(AD-A078269) Avail: NTIS HC A06/MF A01

The lift, drag, and inertia coefficients have been determined experimentally for various tube bundles and for two cylinders at various relative positions subjected to harmonically oscillating flow. The force coefficients for the inline force have been analyzed through the use of the Morison's equation and the Fourier analysis. The transverse force or the lift force has been expressed in terms of its maximum value. The results have shown that the interference between the cylinders can give rise to complex flow patterns and to unexpectedly large force transfer coefficients. The results with two cylinder experiments have shed considerable light on the wake interference in harmonic flows. GRA

N80-20535# Naval Ship Research and Development Center, Bethesda, Md.
DETERMINATION OF STREAMLINE GEOMETRY AND EQUIVALENT RADIUS OVER ARBITRARY BODIES WITH APPLICATION TO THREE-DIMENSIONAL DRAG PROBLEM Interim Report, 1978 - 1979
Tsze C. Tai Dec. 1979 63 p refs
(WR0230201; WR0230200)
(AD-A077878; AERO-1261; DTNSRDC-79/080) Avail: NTIS HC A04/MF A01 CSCL 20/4

An exact method has been developed for determining the streamline geometry and equivalent radius over general three dimensional bodies. This method requires knowledge of either a theoretical or experimental surface inviscid pressure distribution. The full inviscid momentum equations, written in nonorthogonal curvilinear coordinates, are reduced to a set of three first-order ordinary differential equations for determining the streamline geometry. Based on analytical relationships among coordinate variables and the streamline direction, two additional first-order equations are derived for calculating the equivalent radius. Numerical examples, which include an elliptic paraboloid and a wing-fuselage-nacelle configuration, have been considered. Calculated streamline pattern exhibits correct trend, although no comparison has been made because of lack of available data. Application of the method to three dimensional drag problems has been demonstrated. In addition to providing the correct streamline geometry for obtaining the skin friction via the axisymmetric analogue, numerical results show that the method is capable of determining the three dimensional flow separation associated with the free-vortex layer for evaluating the interference drag. GRA

N80-20536# Oregon Univ., Eugene. Dept. of Physics.
TURBULENCE AND STATISTICAL MECHANICS Final Report, 1 Jul. 1976 - 30 Sep. 1979
Russell J. Donnelly Nov. 1979 258 p refs
(Grant AF-AFOSR-2880-76; AF Proj. 2301)
(AD-A079757; AFOSR-79-1357TR) Avail: NTIS HC A12/MF A01 CSCL 07/4

This report summarized research during the period July 1, 1976 to October 1, 1979 directed to understanding turbulence in superfluid helium heat transport. This study showed, for the first time, how to create a reasonably homogeneous turbulent flow in a test section of a heat flow channel. The first systematic study of the power spectrum of turbulent fluctuations was completed. Several theoretical studies of helium 2 were also published, treating elementary excitations, temperature dependent energy levels, equations of motion and restricted geometries. GRA

N80-20537# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A NUMERICAL STUDY OF NORMAL-SHOCK/TURBULENT BOUNDARY LAYER INTERACTIONS M.S. Thesis
Lowell C. Kaal Dec. 1979 77 p refs
(AF Proj. 2307)
(AD-A079858; AFIT/GAE/AA/79D-8) Avail: NTIS HC A05/MF A01 CSCL 20/4

The hybrid finite difference code developed by MacCormack was applied to the investigation of transonic normal-shock turbulent boundary layer interactions. The computations were performed for the half plane of a symetric two dimensional duct by establishing a symmetry boundary condition at the upper boundary. Both first and second order center line boundary conditions were imposed with no measurable difference observed. A two point linear extrapolation of the primative variable was unsuccessfully attempted at the subsonic outflow boundary, but a simple zero gradient condition gave satisfactory results at four different outflow boundary positions relative to the shock wave. Numerical results (M = 1.51, 1.40 and 1.3 Re = 3,000,000 per ft) were compared with the experimental data reported by Abbiss and East. Even though the data exhibit three dimensional effects, the two dimensional computations show agreement within approximately 10%. The differences observed in the numerical-experimental comparisons were all consistent with expected three dimensional trends. Although not conclusive, the potential of adding simple three dimensional corrections to the two dimensional code shows promise for improving the experimental-numerical agreement. GRA

N80-20538# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A CALIBRATION OF THE PRESTON TUBE IN LIQUID FLOW SYSTEMS M.S. Thesis
Brian A. Maher Dec. 1979 78 p refs
(AD-A079876; AFIT/GAE/AA/79D-10) Avail: NTIS HC A05/MF A01 CSCL 20/4

The justification of Preston tube usage is based on a universal similarity law that relates the velocity profile in fully developed pipe flow to that of a boundary layer associated with external flow. The Preston tube measures these velocities at the wall and when calibrated for flow in a pipe, provides a means of determining the local wall shear stress. This study is intended to extend the validity of this method to other working fluids such as liquids. Four separate size Preston tubes are used in three different experiments. The oil pipe provided a unique fluid in a narrow bore pipe and encompassed Reynolds numbers from just turbulent flow to 11600. Results indicated a calibration for oil that closely matched established air data. In the water tunnel experiment some difficulty was encountered for low speed flow but results above Re = 12800 precisely matched that for air. Each tube tested provided similar data and effectively proved the validity of Preston's method for water. GRA

N80-20539# Naval Research Lab., Washington, D. C. Lab. for Computational Physics.
RECENT DEVELOPMENTS IN COMPUTATIONAL TECHNIQUES FOR APPLIED HYDRODYNAMICS Final Report
David L. Book, J. P. Boris, M. J. Fritts, R. V. Madala, B. E. McDonald, N. K. Winsor, and S. T. Zalesak Dec. 1979 75 p refs
(RR0110941; RR0140302)
(AD-A079305; NRL-MR-4095) Avail: NTIS HC A04/MF A01 CSCL 20/4

Recently developed techniques for numerical solution of fluid equations are reviewed. Both convective equations and Poisson's equations are discussed. The emphasis is on methods developed and in use at NRL, although brief descriptions of competitive and related methods are included as background material. Examples and applications are given, with particular attention to the advantages of vector computers. GRA

N80-20540# Naval Research Lab., Washington, D. C. Lab. for Computational Physics.
STABILITY OF SELF-SIMILAR FLOW: UNIFORM IMPLOSION OF AN ABLATIVELY DRIVEN SHELL Interim Report
D. L. Book and Ira B. Bernstein (Yale Univ.) Dec. 1979 32 p refs
(AD-A079890; AD-E000350; NRL-MR-4132) Avail: NTIS HC A03/MF A01 CSCL 20/4

The linear stability of a uniformly imploding shell, modeled

as an ideal polytropic fluid, is investigated. Two types of unstable modes are found: incompressible irrotational perturbations localized at the outer surface, ascribable to Rayleigh-Taylor instability, and compressible modes, associated with convective instability. KIDDER'S (1976) result for the Rayleigh-Taylor modes is shown to hold independently of the form of the shell density profile. By means of a variational principle it is shown that the criterion for convective instability is the existence of a region within which the differential of p times rho to the negative gamma power in respect to r = 0. Analytic solutions for both spatial and temporal dependence of the perturbations are presented, and the results applied to pellets imploded by the action of a laser or charged-particle beam. GRA

N80-20541# ARO, Inc., Arnold Air Force Station, Tenn.
PARTICLE DIAGNOSTICS USING MIE SCATTERING AND IMAGE INTENSIFICATION TECHNIQUES Final Report, Aug. - Oct. 1978
R. L. McGuire, J. W. L. Lewis, D. P. Weaver, and B. P. Curry AEDC Jan. 1980 38 p refs
(AD-A079888; AEDC-TR-79-42) Avail: NTIS HC A03/MF A01 CSCL 20/4

The visualization of a particulate-laden flow field immersed within a hypersonic flow has been achieved using Mie scattering. The visualization technique employed the injection of a modulated laser beam which was expanded to provide observation of a broad spatial region of the particulate plume. The Mie scattered radiation was detected by an image intensifier tube, the output of which was detected by a fast-framing camera. A description is provided of this system, the analysis of the data, and the results. GRA

N80-20542# Washington Univ., Seattle. Dept. of Oceanography.
INITIAL-VALUE PROBLEMS IN STRATIFIED SHEAR FLOWS Ph.D. Thesis
Jerre Eugene Bradt 1979 149 p refs
(Grant AF-AFOSR-3655-78; AF Proj. 2307)
(AD-A079525; AFOSR-79-1358TR) Avail: NTIS HC A07/MF A01 CSCL 20/4

The question of the stability of steady state solutions in geophysical fluid flows is addressed through qualitative analysis and quantitative examples. The inviscid linear stability theory of stratified shear flows and the solution of the stability problem using normal modes and Fourier-Laplace transforms are discussed. Two numerical examples are used to illustrate the relationship of various physical parameters to the stability of the system and to trace the development of the instability for short, intermediate and long times. The examples are (1) two layer fluid of infinite extent with application to the air-sea interface and (2) a two-layer fluid having a free surface and finite depth with application to a salt wedge estuary. The initial-value problem is solved using a power series expansion for short times, superposition of modes for intermediate times and asymptotic analysis for long times. The asymptotic expansion applicable in non-conservative systems is compared with the approximate solution using ray techniques, which are valid in conservative systems, and analytic continuation of the eigenvalues into the complex wavenumber plane. GRA

N80-20543# Mississippi State Univ., Mississippi State. Engineering Industrial Research Station.
THREE-DIMENSIONAL LAMINAR SOLUTION OF THE NAVIER-STOKES EQUATIONS USING BODY-FILTERED COORDINATE SYSTEMS, PART 2 Final Report
C. W. Mastin, J. F. Thompson, A. Ghosh, and T. H. Fu Nov. 1979 27 p refs
(Grant AF-AFOSR-2922-76; AF Proj. 2304)
(AD-A080046; MSSU-EIRS-ASE-79-2; AFOSR-80-0084TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

Numerical methods are developed for constructing body-fitted curvilinear coordinate systems for the region surrounding an arbitrary three dimensional body. Finite difference schemes are investigated for solving the Navier-Stokes equations on body-fitted coordinates. Solutions are computed for flow about a sphere and a finite wing. GRA

N80-20544# Mississippi State Univ., Mississippi State. Engineering Industrial Research Station.
NUMERICAL SOLUTION OF THE TWO-DIMENSIONAL INCOMPRESSIBLE AVERAGED NAVIER-STOKES EQUATIONS FOR FINITE ARBITRARY SHAPED ISOLATED BODIES, PART 1 Final Report
Z. U. Warsi, B. B. Amlicke, and J. F. Thompson Nov. 1979 59 p refs
(Grant AF-AFOSR-2922-76; AF Proj. 2304)
(AD-A080093; MSSU-EIRS-ASE-79-1; AFOSR-80-0083TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

Numerical solutions of the two dimensional averaged Navier-Stokes equations for the prediction of laminar, transitional, and turbulent flow fields around finite bodies of arbitrary shapes have been considered. Numerically generated body-fitted curvilinear coordinates and the relevant metric terms are used to provide the finite-difference solutions of the Navier-Stokes and the equations of turbulent quantities. Complete flow fields, including the boundary layer parameters, are obtained by using the zero, one and two-equations models for Schubauer's elliptical section, NACA663-018 airfoil, and a circular cylinder at free stream Reynolds numbers of 159,000, 1.2 and 1.4 million per foot respectively. In addition, a two-equation model with an algebraic-stress closure has also been developed. GRA

N80-20545# New York Univ., N. Y. Dept. of Applied Science.
NONLINEAR WAVE PROCESS HIERARCHIES AND THE CYCLIC DEVELOPMENT OF QUASI-ORDERED STRUCTURES IN TURBULENT SHEAR FLOWS Final Report, 1 Jul. 1977 - 30 Jun. 1979
Robert Vagilio-Laurin Nov. 1979 35 p refs
(Contract F49620-77-C-0119; AF Proj. 2307)
(AD-A079619; NYU/DAS-79-18; AFOSR-79-1322TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

The nonlinear wave interpretation and description of the large scale coherent structures commonly observed in free as well as bounded turbulent shear flows has been discussed. The experimentally observed cyclic development of nonlinear two dimensional vorticity concentrations in homogeneous, incompressible, free mixing layers has been linked to the growth/equilibration of finite amplitude, spatially amplifying instabilities and their cyclic regeneration under the action of intrinsic secondary instabilities evoked by flow nonlinearity. The mathematical modeling of such nonlinear behavior in terms of matched asymptotic expansion solutions of the Navier-Stokes equations, being reported under separate cover, has been reviewed. The relevance of the physical viewpoint and the mathematical model to more general turbulent flows has been examined and supported by an analysis of selected, conditionally sampled, measurements in transitional and turbulent boundary layers. On that basis, a dominant role of specific nonlinear wave processes has been indicated, and the approach to their systematic mathematical modeling from first principles has been outlined. GRA

N80-20546# Wisconsin Univ. - Madison. Mathematics Research Center.
FINITE-AMPLITUDE SOLITARY WATER WAVES Final Summary Report
C. J. Amick (St. Johns College, Cambridge, England) and J. F. Toland (Essex Univ., England) Oct. 1979 118 p refs
(Contract DAAG29-75-C-0024)
(AD-A079718; MRC-TSR-2012) Avail: NTIS HC A06/MF A01 CSCL 20/4

This paper considers the existence problem for solutions of the free boundary value problem which arises from the question of the existence of solitary gravity waves, moving without changes of form, and with constant velocity, on the surface of ideal fluid in a horizontal canal of finite depth. The analysis imposes no restriction on either the slope or the amplitude of the wave, and we prove that there exists a connected set of solitary waves containing waves of all slope between 0 and PI/6. It is then proved that each of these solitary waves has finite mass, and, as a consequence, that F = 1, where F is the Froude number. This, in turn, tells us that the solitary wave decays faster than exp(-alpha abs.val.(x/h), where alpha is an element of (0, alpha-bar) and (tan alpha-bar) = F squared. Finally, it is shown that, in a certain limit, these solitary waves converge to a

solitary Stokes wave of greatest height, and the validity of Stokes' conjecture for solitary waves is considered, but not resolved. GRA

N80-20547# Ford Aerospace and Communications Corp., Newport Beach, Calif. Aeronutronic Div.
TRANSITION TO TURBULENCE IN FREE SHEAR-LAYERS Final Report, Oct. 1974 - Oct. 1979
A. Demetriades Oct. 1979 80 p refs
(Contract F44620-75-C-0016; AF Proj. 2307)
(AD-A080066; U-6573; AFOSR-80-0056TR) Avail: NTIS HC A05/MF A01 CSCL 20/4

Part 1 of this report presents an investigation of the transition to turbulence in free shear layers. A theoretical analysis is performed to drive a formula for predicting transition, based on the novel approach used earlier by the same investigators to predict transition in wakes and boundary layers. The formula so derived shows that the transition Reynolds number increases as the non-dimensional velocity ratio decreases, and also as the fast side Mach number and slow side total temperature are increased. An experiment to test the theory was performed; together with earlier transition data, the new data provide good support for the theory. However, a strong dependence of the transition Reynolds number on unit Reynolds number characterizes the available data, whereas the theory does not predict such dependence. In Part 2 of this report a brief account is given on the measurement of temperature fluctuations in a cooled compressible turbulent wake. The results endorse the novel detection technique utilized, and support theoretical predictions made earlier under this contract. GRA

N80-20548# Iowa Inst. of Hydraulic Research, Iowa City.
FLUID AND THERMODYNAMIC CHARACTERISTICS OF COMPRESSIBLE RECOIL Final Report, Jun. 1978 - Aug. 1979
Ching Jen Chen and Enzo O. Macagno Aug. 1979 81 p refs
(Grant DAAG29-78-G-0120)
(AD-A078587; ARO-16016.1-A-3E) Avail: NTIS HC A05/MF A01 CSCL 19/6

Fluid dynamic aspect of recoil mechanisms is studied with simple one dimensional analysis as well as two dimensional numerical analysis. Method and procedure for experimental simulation is given. Full scale and reduced scale simulation is analyzed for its advantages and disadvantages. A new numerical scheme called 'finite differential' method is developed to solve the two dimensional unsteady Navier-Stokes equation. The new method utilizes the local analytical solution of the total problem. The solution of the problem is obtained by assembling the local analytic solution. The method is shown to be capable of solving flows with high Reynolds numbers. GRA

N80-20549# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
TECHNIQUE FOR MEASURING THE APPARENT THERMAL CONDUCTIVITY OF FLAT INSULATION
J. P. Moore, D. L. McElroy, and S. H. Jury Oct. 1979 51 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6494) Avail: NTIS HC A04/MF A01

A technique for measuring the apparent thermal conductivity, gamma, of flat insulations - either batt or loose - is described. This technique consists of a flat Nichrome-screen wire sandwiched between two samples and heated electrically. Results from a limited experimental test are described and compared with results from a pipe insulation tester. Thermal modeling of this system shows that accurate measurement with gamma down to 0.01 W/mK and insulation thicknesses below 0.089 m (3 1/2 in.) should be straightforward. Measurement of gamma for material as thick as 0.305 m (12 in.) should also be possible with a lateral guard scheme to reduce heat flow along the screen wire heater. DOE

N80-20550# Sandia Labs., Albuquerque, N. Mex. Fluid Mechanics and Heat Transfer Div.
INTRODUCTION TO COMPUTATIONAL TECHNIQUES FOR BOUNDARY LAYERS
Frederick G. Blottner Sep. 1979 84 p refs
(Contract EY-76-C-04-0789)
(SAND-79-0893) Avail: NTIS HC A05/MF A01

Finite difference procedures to solve boundary layer flows in fluid mechanics are explained. The governing equations and the transformations utilized are described. Basic solution techniques are illustrated with the similar boundary layer equations. Nonsimilar solutions are developed for the incompressible equations. Various example problems are solved, and the numerical results in the FORTRAN listing of the computer codes are presented. DOE

N80-20551# Engineering Societies Commission on Energy, Inc., Washington, D. C.
BASIC RESEARCH IN ENGINEERING: FLUID DYNAMICS AND THERMAL PROCESSES
Aug. 1979 98 p refs Presented at the Fluid Dyn. and Thermal Processes Workshop, Lexington, Ky., 1 Feb. 1979
(Contract EF-77-C-01-2468)
(FE-2468-54; CONF-790240-1) Avail: NTIS HC A05/MF A01

Critical areas for research in fluid mechanics, separation phenomena, energy processing, and energy reactions are identified and discussed for four workshop papers. DOE

N80-20552# Sandia Labs., Albuquerque, N. Mex.
TWO-PHASE JET LOADS
David Thomasko 1979 29 p refs Presented at the 7th Water Reactor Safety Res. Inform. Meeting, Gaithersburg, Md., 5-9 Nov. 1979
(Contract EY-76-C-04-0789)
(SAND-79-1963C; CONF-791118-1) Avail: NTIS HC A03/MF A01

An approximate engineering model characterizing two phase jets emanating from circumferential or longitudinal breaks in a typical pressurized water reactor piping system was developed. Three computer codes were employed to investigate jet load experiments in detail. GRA

N80-20553# Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.
A CALCULATING TECHNIQUE FOR THE FLOW FIELD AROUND A HYDRAULIC TURBINE [EIN VERFAHREN ZUR BERECHNUNG DES STROEMUNGSFELDES UM STRAHLTRIEBWERKE]
Eberhard Goede 1978 97 p refs In GERMAN
(ILR-37; ISBN-3-79830-651-6; ISSN-0341-0587) Avail: NTIS HC A05/MF A01

The panel method is discussed in terms of minimizing the leakage effect when calculating liquid flows around a turbine. A choice of panels is given for specific sections which shows a correct representation of the flow. A mathematical model is presented which aids the best panel. Author (ESA)

N80-20554# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
THEORETICAL STUDY OF STEADY VORTEX RINGS IN THE CASE OF VARIABLE PARTITIONING OF THE FORCE [THEORETISCHE UNTERSUCHUNG STATIONAERER RINGWIRBELSTROEMUNGEN MIT UNSTETIGER WIRBELSTAERKENVERTEILUNG]
Wilfried Poppe Dec. 1978 99 p refs In GERMAN
(MPIS-29/1978) Avail: NTIS HC A05/MF A01; Max-Planck Inst. Fuer Stroemungsforsch., Goettingen, West Germany DM 16,35

Norbury's method of calculating the nucleus of annular vortexes and their translation velocity was verified. The case of a small nucleus (with respect to diameter of the ring) as well as a nonsymmetric nucleus were studied. The methods of calculation and the numerical methods used to study the variable partitioning of turbulent energy are described. Author (ESA)

N80-20555# National Technical Information Service, Springfield, Va.
BOUNDARY LAYER TRANSITION, VOLUME 4. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Nov. 1977 - Nov. 1979
Guy E. Habercom, Jr. Dec. 1979 259 p Supersedes NTIS/PS-78/1344; NTIS/PS-77/1116; NTIS/PS-78/1344; NTIS/PS-75/818
(PB80-803265; NTIS/PS-78/1344; NTIS/PS-77/1116;

NTIS/PS-76/0940; NTIS/PS-75/818) Avail: NTIS HC $30.00/MF $30.00 CSCL 20D

Topics on boundary layer transition including laminar to turbulent flow in gases at subsonic, transonic, supersonic, and hypersonic velocities; transition in the boundary layer flow of various liquids; flow transition involving structural and configurations forms; experimental equipment; facilities tests, and methods are presented. Mathematical and computer aided analyses and methods of inducing inhibiting transition are addressed. Applications of boundary layer research to aerospace vehicles, wings, airfoils, geometric forms, and models are discussed. This updated bibliography contains 259 abstracts, 57 of which are new entries to the previous edition. GRA

N80-20566# Purdue Univ., Lafayette, Ind. Water Resources Research Center.

LABORATORY STUDY OF FLOW AND THERMAL STRUCTURES IN HEATED AND/OR COOLED LAYERS OF WATER

M. Behnia and R. Viskanta Aug. 1979 234 p refs (Contract DI-14-34-0001-6075; OWRT Proj. B-077-IND(5)) (PB80-120694; PWRRC-TR-123; WB0-01799) Avail: NTIS HC A11/MF A01 CSCL 13B

The basic internal transport processes in natural waters and the interactions at the air water interface were studied. Thermal and flow structure in a stratified layer of water heated by radiation source and/or cooled by forced air flow over the surface was studied in the laboratory. The transport processes occurring in impounded waters were simulated in a test cell. Heating from below of a nonuniformly stratified layer of water was studied to obtain understanding of turbulent mixing processes in an inherently unstable situation. A model based on conservation principles and turbulence was developed which agreed reasonably well with the experimental data. GRA

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N80-20557 Stanford Univ., Calif.

MODELING AND ERROR ANALYSIS OF A SUPERCONDUCTING GRAVITY GRADIOMETER Ph.D. Thesis

Kai Yuen Wang 1979 257 p

Avail: Univ. Microfilms Order No. 8006366

The feasibility of a cryogenic gravity gradiometer is demonstrated. A pair of superconducting accelerometers were constructed and tested in a push pull arrangement. The resolution of the experimental unit is estimated to be about 50 E. A study to model the responses of the gravity gradiometer to the various external inputs is conducted. The mathematical equations derived are used in the design of the loaded diaphragm proof mass. The error sources of the gravity gradiometer are identified. The theory of electronic damping for the cryogenic device is developed. An experimental circuit for the noiseless damping of a single accelerometer is described. Dissert. Abstr.

N80-20558 Johns Hopkins Univ., Baltimore, Md.

DIGITAL WAVEFORM RECORDING AND COMPUTER ANALYSIS OF ACOUSTIC EMISSION AND ULTRASONIC TRANSIENTS DETECTED BY OPTICAL AND PIEZOELECTRIC PROBES Ph.D. Thesis

Borislav Roro Djordjevic 1980 150 p

Avail: Univ. Microfilms Order No. 8006909

Innovative optical probes and conventional piezoelectric transducers were used to detect acoustic emission and ultrasonic transients in solid materials. Digital signal recording and computer analysis methods were developed for critical evaluation of the these transients. The fast digitizing acquisition system permitted coincident and simulataneous two channel recording thus allowing direct comparison of the same event as sensed by two different detectors. Optical detection of carefully controlled acoustic emission events confirmed the suspected inadequacy of piezoelectric transducers for recording the actual waveforms characteristic of the source. In addition, optical detection showed that piezoelectric transducers have limited capability for direct reproduction of ultrasonic waveforms even for the case of normally incident plane wavefronts. Dissert. Abstr.

N80-20559* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

CdS SOLID STATE PHASE INSENSITIVE ULTRASONIC TRANSDUCER Patent

Joseph S. Heyman, inventor (to NASA) Issued 25 Mar. 1980 8 p Filed 26 Jul. 1978 Supersedes N78-29871 (16 - 20, p 2725)

(NASA-Case-LAR-12304-1; US-Patent-4,195,244; US-Patent-Appl-SN-928130; US-Patent-Class-310-311; US-Patent-Class-29-25.35; US-Patent-Class-310-327; US-Patent-Class-310-334; US-Patent-Class-310-360) Avail: US Patent and Trademark Office CSCL 14B

A phase insensitive ultrasonic transducer which includes a CdS crystal that is annealed for a selected period of time and at a selected temperature to provide substantially maximum acoustic attenuation at the operating frequency of the transducer is described. Two electrodes are attached to the crystal with amplifier means and a signal processing system connected to one of the electrodes to provide an ultrasonic receiver.

Official Gazette of the U.S. Patent and Trademark Office

N80-20560* National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.

ATTACHING OF STRAIN GAGES TO SUBSTRATES Patent

Meyer M. Lemcoe (Battelle Columbus Labs., Ohio) and Harry E. Pattee, inventors (to NASA) (Battelle Columbus Labs., Ohio) Issued 25 Mar. 1980 4 p Filed 16 Feb. 1978 Supersedes N78-18393 (16 - 09, p 1160) Sponsored by NASA

(NASA-Case-FRC-10093-1; US-Patent-4,195,279; US-Patent-Appl-SN-878539; US-Patent-Class-338-2; US-Patent-Class-219-85R; US-Patent-Class-219-85CA; US-Patent-Class-219-85CM) Avail: US Patent and Trademark Office CSCL 14B

A method and apparatus for attaching strain gages to substrates is described. A strain gage having a backing plate is attached to a substrate by using a foil of brazing material between the backing plate and substrate. A pair of electrodes that are connected to a current source, are applied to opposite sides of the backing plate, so that heating of the structure occurs primarily along the relatively highly conductive foil of brazing material. Field installations are facilitated by utilizing a backing plate with wings extending at an upward incline from either side of the backing plate, by attaching the electrodes to the wings to perform the brazing operation, and by breaking off the wings after the brazing is completed.

Official Gazette of the U.S. Patent and Trademark Office

N80-20561 Pennsylvania State Univ., University Park.

TRANSIENT RESPONSE OPTIMIZATION OF PIEZOELECTRIC DISC TRANSDUCERS BY TIME DOMAIN TECHNIQUES Ph.D. Thesis

Henry Alan Wolf 1979 250 p

Avail: Univ. Microfilms Order No. 8006072

Design procedures for reducing the mechanical ringing of piezoelectric disc transducers under impulsive electrical excitation are examined. The transducer was treated as a three port device: the two mechanical ports and one electrical port. Improvements to the transient response were sought through the determination of appropriate matching networks at the ports. The optimization of specified time domain characteristics was accomplished by performing a gradient search over a parameter space defining the port matching configurations. The transducer and mechanical matching sections were modeled using the Mason equivalent circuit and the distributed parameter wave guide model. Transformation to the time domain was achieved using a numerical approximation to the Laplace transform. Dissert. Abstr.

N80-20562 Purdue Univ., Lafayette, Ind.
SOME ASPECTS OF BLOCK QUANTIZATION WITH APPLICATIONS TO SOURCE CODING AND DIGITAL HOLOGRAPHY Ph.D. Thesis
James Atlee Bucklew 1979 109 p
Avail: Univ. Microfilms Order No. 8005837

It is shown that the mean square error for optimal uniform and nonuniform one dimensional quantizers is given by the quantizer input variance minus the output variance. In the two-dimensional case when the random variable has a circularly symmetric probability density, an expression that indicates whether a polar or Cartesian format produces a smaller mean square error is derived. The independent two dimensional Gaussian case is considered in detail and tabulations are made of the expected mean square error for a number of quantizer output levels. An error expression is also derived for spectral phase coding, a polar format coding scheme. The scheme is shown to be insensitive to changes in signal statistics. Finally, several computer generated holograms with information represented in polar and rectangular format are compared and error expressions are derived.
Dissert. Abstr.

N80-20563* National Aeronautics and Space Administration. Pasadena Office, Calif.
VELOCITY SERVO FOR CONTINUOUS SCAN FOURIER INTERFERENCE SPECTROMETER Patent
Rudolf A. Schindler, inventor (to NASA) (JPL) Issued 18 Mar. 1980 6 p Filed 24 Feb. 1978 Supersedes N78-22891 (16 - 13, p 1778) Sponsored by NASA
(NASA-Case-NPO-14093-1; US-Patent-4,193,693; US-Patent-Appl-SN-880729; US-Patent-Class-356-346) Avail: US Patent and Trademark Office CSCL 14B

A velocity servo for continuous scan Fourier interference spectrometer of the double pass retroreflector type having two cat's eye retroreflectors is described. The servo uses an open loop, lead screw drive system for one retroreflector with compensation for any variations in speed of drive of the lead screw provided by sensing any variation in the rate of reference laser fringes, and producing an error signal from such variation used to compensate by energizing a moving coil actuator for the other retroreflector optical path, and energizing (through a highpass filter) piezoelectric actuators for the secondary mirrors of the retroreflectors.
Official Gazette of the U.S. Patent and Trademark Office

N80-20564*# National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va.
AN INITIAL ASSESSMENT OF THE PERFORMANCE ACHIEVED BY THE SEASAT-1 RADAR ALTIMETER
William F. Townsend Feb. 1980 41 p refs
(NASA-TM-73279) Avail: NTIS HC A03/MF A01 CSCL 14B

The results of an initial on-orbit engineering assessment of the performance achieved by the radar altimeter system flown on SEASAT-1 are presented. Additionally, the general design characteristics of this system are discussed and illustrations of altimeter data product are provided. The instrument consists of a 13.5 GHz monostatic radar system that tracks in range only using a one meter parabolic antenna pointed at the satellite nadir. Two of its unique features are a linear FM transmitter with 320 MHz bandwidth which yields a 3.125 nanosecond time delay resolution, and microprocessor implemented closed loop range tracking, automatic gain control (AGC), and real time estimation of significant wave height (SWH). Results presented show that the altimeter generally performed in accordance with its orginal performance requirments of measuring altitude to a precision of less the 10 cm RMS, significant wave height to an accuracy of + or - 0.5 m or 10%, whichever is greater, and ocean backscatter coefficient to an accuracy of + or - 1 db, all over an SWH range of 1 to 20 meters. J.M.S.

N80-20565*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INORGANIC SPARK CHAMBER FRAME AND METHOD OF MAKING THE SAME Patent Application
Thomas M. Heslin, inventor (to NASA) Filed 7 Mar. 1980 22 p
(NASA-Case-GSC-12354-1; US-Patent-Appl-SN-128229) Avail: NTIS HC A02/MF A01 CSCL 14B

A spark chamber frame includes a number of beams formed from an inorganic materials such as cermic or glass which are connected together with an inorganic bonding material having substantially the same thermal expansion as the beam material. A number of wires also formed from an inorganic composition are positioned between opposed beams so that wires are uniformly spaced and form a grid. Four hold-down straps, also formed of ceramic or glass and having substantially the same chemical and thermal properites as the beam material, overlie the wires and are bonded to the beams. NASA

N80-20566# Air Force Avionics Lab., Wright-Patterson AFB, Ohio. Electro-optics Technology Branch.
PASSIVE FIBER OPTIC GYRO STUDY Final Report, 1 May - 31 Jul. 1979
Tom L. Williamson and Douglas A. Wille Oct. 1979 62 p refs
(AD-A079471; AFAL-TR-79-1197) Avail: NTIS HC A04/MF A01 CSCL 17/7

The report summarizes the principles of operation of the passive fiber optic gyro. It starts with a discussion of the Sagnac effect and proceeds to a theoretical prediction of the optimum shot noise limited performance. An overview of the major requirements and problems associated with the principal components follows. This leads to a discussion of the signal processing, some conclusions, and recommendations with respect to specific areas for further investigations. GRA

N80-20567# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
HOLOGRAPHIC INTERFEROMETRIC SURVEY OF BOUNDARY LAYER TRANSITION IN AN AXISYMMETRIC FREE CONVECTION THERMAL BOUNDARY LAYER M.S. Thesis
Gregory S. Meserve Dec. 1979 73 p
(AD-A079880; AFIT/GAE/AA-79D-12) Avail: NTIS HC A04/MF A01 CSCL 14/2

Unique optical data from the laminar and transition regions of an axisymmetric free convection thermal boundary layer are presented. The boundary layer encompasses a vertically oriented right circular cylinder kept at a constant wall temperature and suspended in a quiescent air environment. Pulse laser holographic interferometry was used to obtain a measurement of the temperature distribution through the boundary layer. Schlieren methods are used to photograph the boundary layer to provide a qualitative description of the transition region. An approach is outlined to find an approximate numerical solution for the temperature distribution through the boundary layer. Integral equations are developed for a differential control volume within the boundary layer after which assumed velocity and temperature distributions are used to reduce the integral equations to first order non-linear differential equations. The differential equations are non-dimensionalized and numerical techniques are used in an attempt to obtain a solution. Quantitative data from the laminar region resulted in a discrepancy between theoretical and experimental evaluation of a local Nusselt number. Qualitative observation of the transition region reveals a fringe reversal phenomena that could possibly be associated with the fundamental mechanisms of transition. GRA

N80-20568# Argonne National Lab., Ill.
EVALUATION OF SOME CRYOGENIC SENSORS AND INSTRUMENTATIONS FOR A LARGE SUPERCONDUCTING MHD MAGNET
S. H. Kim, S. T. Wang, N. S. Kim, and M. Lieberg 1979 15 p refs Presented at Cryogenic Engr. Conf., Madison, Wis., 21-24 Aug. 1979
(CONF-790815-30) Avail: NTIS HC A02/MF A01

The evaluation of six accelerometers, 95 strain gages, and 110 thermometers to be installed in a large superconducting MHD magnet is discussed. The sensors will monitor stress and strain levels of the support structures, mechanical perturbations, and temperature variations during cooldown, warmup, transportation, and operation of the magnet. K.L.

N80-20569# National Bureau of Standards, Washington, D.C.
AMERICAN NATIONAL STANDARD N538-1979 CLASSIFICATION OF INDUSTRIAL IONIZING RADIATION

GAUGING DEVICES Final Report
Oct. 1979 31 p
(PB80-11012; NBS-HB-129; ANSI-N538-1979; LC-79-600113) Avail: NTIS HC A03/MF A01 CSCL 06R

This American National Standard applies to the radiation safety aspects of gauging devices, commonly called gauges, which use sealed radioactive sources or X-ray tubes for the determination of control of thickness, density level, interface location, or qualitative or quantitative chemical composition. This standard establishes a system for classification of gauging devices based on performance specifications relating to radiation safety. In addition to specific tests for both use conditions and accident conditions, guidelines for other safety features and considerations are presented. GRA

N80-20570# National Bureau of Standards, Washington, D.C. National Measurement Lab.
FRAME C: A COMPACT PROCEDURE FOR QUANTITATIVE ENERGY-DISPERSIVE ELECTRON PROBE X-RAY ANALYSIS Final Report
R. L. Myklebust, C. E. Fiori, and K. F. J. Heinrich Sep. 1979 115 p refs
(PB80-110307; NBS-TN-1106) Avail: NTIS HC A06/MF A01 CSCL 14B

A data evaluation procedure (FRAME C) for carrying out quantitative electron probe microanalysis with a lithium-drifted silicon detector was developed for use with a small computer. The procedure consists of a background correction calculated from two selected background regions of interest, a simple method of resolving overlapping peaks, and the matrix corrections for characteristic radiation. To save computation time, small groups of adjacent channels (regions of interest) in the multichannel analyzer rather than individual channels are used for the calculations. The method for computing the overlap factors is described. Examples of several types of analyses are presented. GRA

N80-20571# Colorado Univ. at Boulder. Dept. of Electrical Engineering.
DISPERSION AND ATTENUATION CHARACTERISTICS OF MODES IN A TEM-CELL WITH A LOSSY DIELECTRIC SLAB
John C. Tippet and David C. Chang Aug. 1979 38 p refs
(Contract NBS-CST-8447)
(PB80-105141; NBSIR-79-1615) Avail: NTIS HC A03/MF A01 CSCL 14B

Dispersion and attenuation characteristics of the dominant mode in a transverse electromagnetic cell, loaded with a lossy dielectric slab, were investigated. It is shown that, while the insertion of the lossy material can indeed lower the Q factor of the higher order modes, the attenuation of the dominant mode also increases drastically as frequency increases. GRA

N80-20645# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
ELABORATION OF THE TIME SYSTEM OF THE SATELLITE OBSERVATION STATION WETTZELL FROM 1972-1977 [DER AUFBAU DES ZEITSYSTEMS DER SATELLITENBEOBACHUNGSSTATION WETZELL IN DGN JAHREN 1972-1977)]
Klemens Nottarp and Ingo Zeitel *In its* Rept. on Cartography and Geodesy, Ser. 1: Original Rept. No. 73 1977 p 87-91 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20696# Bayerische Akademie der Wissenschaften, Munich (West Germany).
THE GERMAN-AUSTRIAN DOPPLER OBSERVATION CAMPAIGN [UEBER DEN DERZEITIGEN STAND DER ARBEITEN IM DEUTCHEN ANTEIL DER DEUTSCH OESTERREICHISCHEN DOPPLERMESSKAMPAGNE]
Wolfgang Schlueter, Hermann Seeger, Gerhard Soltau, Peter Wilson, and Peter Wolf *In its* Res. Program 78, Satellite Geodesy Program 1978 p 54-64 refs In GERMAN (For primary document see N80-20691 11-42)
Avail: NTIS HC A09/MF A01

36 LASERS AND MASERS

Includes parametric amplifiers.

N80-20572 Maryland Univ., College Park.
DOWNSTREAM MIXING GASDYNAMIC LASERS: A NUMERICAL SOLUTION Ph.D. Thesis
Karungulam Natesan Parthasarathy 1979 164 p
Avail: Univ. Microfilms Order No. 8007108

A numerical solution for downstream mixing gasdynamic laser flows is considered. In particular, the supersonic mixing flows of vibrationally excited N2 with cold CO2 and H2O downstream of the nozzle exits is studied. The unsteady, two dimensional Navier-Stokes equations, fully coupled with the appropriate finite rate vibrational kinetic equations are solved by means of a time dependent finite difference numerical technique. The main thrust of the work is the investigation of the fluid dynamic and kinetic aspects of mixing. The detailed, but complex vibrational kinetic processes that occur in the CO2-N2 system are simplified by the use of either a two mode model, or a three mode model. The effect of the boundary layers issuing from the nozzles on the mixing phenomenon is studied. Dissert. Abstr.

N80-20573 Stanford Univ., Calif.
GENERATION OF 16 MICRON RADIATION USING STIMULATED ROTATIONAL RAMAN SCATTERING IN HYDROGEN Ph.D. Thesis
William Richard Trutna, Jr. 1979 134 p
Avail: Univ. Microfilms Order No. 8006360

Stimulated rotational Raman scattering was used to frequency shift a CO2 TEA laser from 10.6 micrometers to 16.95 micrometers. Two techniques were used to lower the CO2 laser power requirements: a 25 transit Raman cell was constructed, which maintains a high pump intensity over a long distance, to maximize Raman gain; and, four wave mixing was utilized to generate 16.95 micrometer signal at the kilowatt level to inject into the Raman amplifier. Since the CO2 laser tends to oscillate at many axial mode frequencies, a study to determine the dependence of Raman gain and Stokes bandwidth upon the pump laser bandwidth was undertaken. The results were experimentally verified using a variable bandwidth Nd:YAG laser at 1.06 micrometers. The results of experiments with an antiresonant ring resonator operated with a low pressure pulsed CO2 laser are described. Dissert. Abstr.

N80-20574*# National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD AND APPARATUS FOR CONVECTION CONTROL OF METALLIC HALIDE VAPOR DENSITY IN A METALLIC HALIDE LASER Patent Application
Thomas J. Pivirotto, inventor (to NASA) (JPL) Filed 14 Mar. 1980 14 p
(Contract NAS7-100)
(NASA-Case-NPO-15021-1; US-Patent-Appl-SN-130496) Avail: NTIS HC A02/MF A01 CSCL 20E

A method and apparatus for convection control of metallic halide vapor density in a metallic halide laser are described. A reservoir containing copper chloride is heated so that the copper chloride is maintained in a liquid form. The apparatus includes a means for flowing a buffer gas (neon) over the liquid copper chloride to provide a mixture of copper chloride vapor and neon above the liquid copper chloride. A conduit for providing fluid communication between the reservoir containing the copper chloride vapor/neon mixture and the laser is also included. The copper chloride vapor density in the laser is related to the liquid copper chloride temperature and the neon flow rate through the reservoir. Neon is also provided directly to the laser in order to provide a further means of controlling the copper chloride vapor density in the laser. NASA

N80-20575*# Ohio State Univ. Research Foundation, Columbus.
ERROR ANALYSIS FOR A SPACEBORNE LASER RANGING SYSTEM
Erricos C. Pavlis Dec. 1979 89 p refs
(Grant NsG-5265; OSURF Proj. 711055)
(NASA-CR-162887; Rept-290) Avail: NTIS HC A05/MF A01 CSCL 20E

The dependence (or independence) of baseline accuracies, obtained from a typical mission of a spaceborne ranging system, on several factors is investigated. The emphasis is placed on a priori station information, but factors such as the elevation cut-off angle, the geometry of the network, the mean orbital height, and to a limited extent geopotential modeling are also examined. The results are obtained through simulations, but some theoretical justification is also given. Guidelines for freeing the results from these dependencies are suggested for most of the factors. M.G.

N80-20576# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ELECTROOPTICAL DEVICES Semiannual Technical Summary Report, 1 Oct. 1978 - 31 Mar. 1979
Charles E. Hurwitz 31 Mar. 1979 20 p refs
(Contract F19628-78-C-0002; AF Proj. 2611)
(AD-A077153; ESD-TR-79-183) Avail: NTIS
HC A02/MF A01 CSCL 20/5

This report covers work carried out with support of the Department of the Air Force during the period 1 October 1978 through 31 March 1979. The current objectives of the electrooptical device program are: (1) to perform life tests on GaIn AsP/InP double-heterostructure (DH) diode lasers operating in the 1.0- to 1.3-micrometer wavelength region and analyze the degradation mechanisms, and (2) to fabricate and study avalanche photodiodes of similar composition GaInAsP operating in the same wavelength region. GRA

N80-20577# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
SEPARATION CONTROL IN ALL APT LIGHT PIPE M.S. Thesis
W. H. Bailey, Jr. Dec. 1979 92 p refs
(AD-A079904; AFIT/GAE/AE/79D-1) Avail: NTIS
HC A05/MF A01 CSCL 20/5

An experiment was performed to determine separation regions inside a high energy laser (HEL) beam relay light pipe. The pipe is part of the beam relay system used in conjunction with the CO2 Gas Dynamic Laser (GDL) system under development by the Air Force Weapons Laboratory. It was found that the air flowing through the pipe separated at the elbows. This separation can cause uneven radial heating attributed to molecular absorption. The self-induced thermal distortion of the beam can cause phase distortions degrading the beam. A study of separation control systems within the pipe was made. A full-scale axisymmetric model was studied on the water table. Areas of separation were found by flow visualization using dye injection. A brief evaluation of suction and blowing to control separation showed both of these methods acceptable. Separated regions discovered at each elbow on the water table were the focus of study for a full-scale air flow plexiglass model. The turbulent flow in the pipe was studied using smoke injection to reveal air motion in the pipe. Mass flow rates of air through the pipe were 1 lb/min and 8 lbs/min. Suction and blowing were assessed as flow separation control methods. GRA

N80-20578# United Technologies Research Center, East Hartford, Conn.
BEAMED ENERGY COUPLING STUDIES Final Technical Report, 1 Jun. 1977 - 31 May 1979
M. C. Fowler, L. A. Newman, and D. C. Smith Edwards AFB, Calif. AFRPL Jan. 1980 134 p refs
(Contract F04611-77-C-0039; AF Proj. 2308)
(AD-A080037; UTRC/R79-922895; AFRPL-TR-79-51) Avail: NTIS HC A07/MF A01 CSCL 21/8

This report describes the analytical and experimental results of a study to determine the feasibility of using molecular seeds to couple CO2 laser radiation and CO laser radiation to the working fluid, H2, of a high performance rocket thruster. The gas mixtures studied experimentally were H2/H2O, H2/D2O, and H2/NH3 at CO2 laser wavelengths. The promise of CO as an absorber of CO laser radiation was established analytically. To attain the high temperatures, 1000-6000K, desired, these mixtures were placed in a cell positioned in a diagnostic apparatus which determined the spatial variation of the mixture absorption coefficient and temperature about the axis of a hot, dense plasma sustained by focused high power CW CO2 laser radiation. The measurements on these mixtures indicated their performance as couplers to exceed expectations created by the analytical study. In addition, it was found that in the absence of plasma, the temperature of the mixtures could be raised to temperatures as high as 2000-4000K simply by absorption by the mixture of laser energy at the high power beam focal spot to create the observed laser sustained flame. Further work is needed to determine the conditions under which this flame can be sustained in the laser energized rocket thruster. GRA

N80-20579# ARO, Inc., Arnold Air Force Station, Tenn.
STUDIES OF THE STATISTICAL BIAS AND SIGNAL CHARACTERISTICS OF LASER VELOCIMETERS Final Report, Jul. 1976 - Sep. 1977
D. O. Barnett and T. V. Giel, Jr. AEDC Jan. 1980 147 p refs
(AD-A079634; AEDC-TR-78-65) Avail: NTIS
HC A07/MF A01 CSCL 14/2

Analyses are presented of (1) the statistical bias individual realization laser velocimeters (LV's) and (2) the theoretical signal amplitudes obtained from dual-scatter (fringe) LV's. The analyses are compared to experimental data obtained from a subsonic, confined, seeded jet. The statistical bias study reviews the various formulations relating LV sampling characteristics to the velocity field and shows that, theoretically, bias is reduced by random sampling, introduction of fixed-time delays between samples, and nonuniformities in seeding. These concepts are tested by a bias simulation program which simulates LV response to a turbulent flow by applying various sampling laws to hot-wire anemometer data. The finite-difference algorithms suggested by various investigators to eliminate bias from LV data fail if the sampling rate is less than the local integral time scale of the turbulent flow. Velocity data for the near field of a uniformly seeded subsonic jet exhausting into a plenum were obtained by pitot probes, hot-wire anemometers, and a Bragg-diffracted laser velocimeter. No consistent bias of the data was observed, indicating that routinely correcting LV data for statistical bias may lead to significant errors. GRA

N80-20580# Brookhaven National Lab., Upton, N. Y.
FREE ELECTRON LASER: AN INTRODUCTION
C. Pellegrini 1979 7 p refs Presented at the Free Electron Laser Workshop, Riva del Garda, Italy, 4 Jun. 1979
(Contract EY-76-C-02-0016)
(BNL-26501; CONF-7906123-1) Avail: NTIS
HC A02/MF A01

The theory and operating principles of the free electron laser are discussed. DOE

N80-20581# Lincoln Lab., Mass. Inst. of Tech., Lexington.
EFFICIENT HIGH ENERGY INFRARED THIRD HARMONIC GENERATION IN GASES AND LIQUIDS FOR LASER FUSION APPLICATIONS Final Report, 1 Mar. 1977 - 28 Feb. 1979
H. Kildal and S. R. J. Brueck May 1979 21 p
(COO-4251-7) Avail: NTIS HC A02/MF A01

A 4% third harmonic generation (THG) energy conversion efficiency was achieved and for 8-nsec-duration input pulses in a liquid CO-O2 medium (10 cm path length). The THG input-output characteristics in the saturation and pump-depletion regime were measured. A 2% THG power conversion efficiency was obtained for 120-nsec duration input pulses in liquid CO-O2-SF6 mixtures. A theoretical model was developed for two-photon resonant THG processes in different focusing geometries. Liquid CO two-photon resonance parameters were measured in various diluents. The calculated resonant third-order susceptibility for different CO concentrations were verified. The nonresonant third-order susceptibility in liquid CO-O2 and the wave-vector mismatch in liquid CO-O2 mixture was measured. Phase-matching techniques for THG were developed. Alternate systems for tripling of CO2 and HF laser radiation were analyzed, and a 1- to 10-nsec pulse duration CO2 laser facility and cryogenic liquid Dewars with 10 cm to 1 m optical path lengths were constructed. DOE

N80-20582# Lincoln Lab., Mass. Inst. of Tech., Lexington.
INVESTIGATION OF Hg2 AS A DISCHARGE PUMPED OPTICAL STORAGE MEDIUM Final Report
D. J. Ehrlich and R. M. Osgood, Jr. Dec. 1978 30 p refs
(Contract ED-78-S-02-4630)

(CDO-4630.A000-1) Avail: NTIS HC A03/MF A01

The extraction of energy from metastable Hg2 by optical techniques is considered. Topics covered include: (1) assessment of optical extraction techniques for laser fusion applications; (2) demonstration of 20X enhancements in the population of the UV-radiating level by optical pumping with mid-IR lasers; (3) analysis of the IR optical pumping process through the induced emission spectrum; (4) parametric studies of the excitation wavelength, temperature and pressure dependences of extraction by optical pumping; (5) studies of the saturation of mid-IR optical pumping; (6) modeling of large-scale extraction for laser fusion applications; (7) studies of optical pumping of Hg2 by high power ArF laser (193 nm) radiation, and (8) studies of Hg2 excimer structure and collisional destruction rates. DOE

N80-20583# Rockwell International Corp., Canoga Park, Calif. Energy Systems Group.

CONCEPTUAL DESIGN STUDY OF THE HYLIFE LITHIUM WATERFALL LASER FUSION CHAMBER Annual Report, Fiscal Year 1978

29 Sep. 1978 109 p refs

(Contract W-7405-eng-48)

(UCRL-13944) Avail: NTIS HC A06/MF A01

Conceptual design studies of the target chamber defined the general configuration and dimensions of the chamber and the inlet plenum, orifice plate, and nozzle concepts required to generate the desired lithium jet fall. Preliminary studies were performed of the target chamber interfaces with the liquid lithium supply system, the laser system, the pellet injection system, and the target chamber mounting and support system. Target chamber environmental effects resulting from typical thermonuclear burns were evaluated. The outlet region of the target chamber was outlined conceptually, and preliminary design considerations were given to the annual graphite reflector regions of the target chamber and the associated liquid lithium coolant passages. DOE

N80-20584# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

A STUDY OF THE COLLISION PROCESSES IN THE THERMIC ENERGY REGION BY USING ATOMS EXCITED BY LASER LIGHT [UNTERSUCHUNGEN VON STOSSPROZESSEN MIT LASERANGEREGTEN ATOMEN IN THERMISCHEN ENERGIEBEREICH]

Harald Tischer Aug. 1978 68 p refs In GERMAN

(MPIS-2/1978; ISSN-0436-1199; Rept-2) Avail: NTIS HC A04/MF A01; Max-Planck Inst. fuer Stroemungsforsch., Goettingen, West Germany DM 12.90

An argon laser was used to investigate the conditions of excitation of Na atoms. Problems encountered with laser stability and in obtaining the desired energy density in the shock region are discussed. Measurements of the transverse dispersion which varied with the polarization of the laser beams are presented. Author (ESA)

N80-20585# National Technical Information Service, Springfield, Va.

GALLIUM ARSENIDE LASERS. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Nov. 1979

Brian Carrigan Jan. 1980 202 p Supersedes NTIS/PS-78/1326; NTIS/PS-77/1176; NTIS/PS-76/1042; NTIS/PS-75/792; NTIS/PS-75/044

(PB80-803612; NTIS/PS-78/1326; NTIS/PS-77/1176; NTIS/PS-76/1042; NTIS/PS-75/792; NTIS/PS-75/044) Avail: NTIS HC $30.00/MF $30.00 CSCL 20E

The design, development, and applications of gallium arsenide lasers are discussed. Studies on band theory, optical modulators, emission spectra, optical pumping, tuning, and efficiency of these lasers are included. This updated bibliography contains 195 abstracts, 22 of which are new entries to the previous edition. GRA

N80-20586# National Technical Information Service, Springfield, Va.

HYDROGEN FLUORIDE AND DEUTERIUM FLUORIDE LASERS, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS, 1976-1979

Bryan Carrigan Dec. 1979 160 p refs Supersedes NTIS/PS-78/1307; NTIS/PS-77/1168; NTIS/PS-733

(PB80-803273; NTIS/PS-78/1307; NTIS/PS-77/1168; NTIS/PS-76/0979; NTIS/PS-75/733) Avail: NTIS HC $30.00/MF $30.00 CSCL 20E

The chemical reactions, molecular interactions, kinetics, and quantum mechanics in hydrogen fluoride and deuterium fluoride laser development are cited. Studies on excitation, optical equipment, gas mixtures, and window materials for these lasers are included. The spectral output, power, efficiency, applications, and performance of HF and DF lasers are also covered. This updated bibliography contains 160 abstracts, 18 of which are new entries to the previous edition. GRA

N80-20642# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

SFB 78/IFAG PROJECTS FOR LASER MEASUREMENT OF DISTANCES TO SATELLITES [UEBER VORHABEN DES SFB 78/IFAG ZUR LASERENTFERNUNGSMESSUNG NACH SATELLITEN]

Klemens Nottarp, Hermann Seeger, and Peter Wilson *In its* Rept. on Cartography and Geodesy, Ser. 1: Original Rept. No. 73 1977 p 63-72 refs In GERMAN (For primary document see N80-20638 11-42)

Avail: NTIS HC A11/MF A01

N80-20693# Bayerische Akademie der Wissenschaften, Munich (West Germany).

SELECTION OF A RUBY LASER FOR USE AS AN ILLUMINATING LASER FOR THE BMK75 OR AS A REFLECTING LASER FOR SRS [KONZEP EINES RUBINLASER FUER WAHLWEISEN BETRIEB ALS BELEUCHTUNGSLASER FUER DIE BMK 75 ODER ENTFERMUNGSMESSLASER FUER DAS SRS]

Klemens Mottarp *In its* Res. Program 78, Satellite Geodesy Program 1978 p 31-35 refs In GERMAN (For primary document see N80-20691 11-42)

Avail: NTIS HC A09/MF A01

N80-20695# Bayerische Akademie der Wissenschaften, Munich (West Germany).

EXTENDING THE NEODYMIUM-YAG LASER REFLECTANCE MEASURING SYSTEM TO LUNAR MEASUREMENTS AT THE WETZELL STATION [ZUR ERWEITERUNG DES NEODYMIUM-YAG LASERENTFERNUNGSMESSYSTEMS DER STATION WETTZELL FUER ENTFERNUNGSMESSUNGEN ZUM MOND]

Peter Wilson *In its* Res. Program 78, Satellite Geodesy Program 1978 p 45-49 refs In GERMAN (For primary document see N80-20691 11-42)

Avail: NTIS HC A09/MF A01

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N80-20587 Virginia Univ., Charlottesville.

ROTOR MODEL PARAMETERS ESTIMATION AND ROTOR BALANCING STUDIES WITH QUADRATIC PROGRAMMING Ph.D. Thesis

Emerson Keith Woomer 1979 133 p

Avail: Univ. Microfilms Order No. 8004602

The parameter estimation problem is formulated as an optimization process in which unknown constants in the system model are adjusted to give the best agreement between the measured response of the rotor to an applied unbalance and the predicted response from the model. A computer code based on Lemke's algorithm for quadratic programming is used to demonstrate the reliable, efficient computation of rotor balance weights when upper bounds are placed on the weight magnitudes. Heuristic criteria for estimating best choices of balance weight locations are evaluated by comparing the predictions based on the criteria to optimal locations determined by exhaustive search or estimated by random sampling. The influence of the distribution of intrinsic shaft unbalance on optimal balance weight locations and on the magnitudes of normalized curves of shaft deflections and phases is also studied. Dissert. Abstr.

N80-20588*# Georgia Inst. of Tech., Atlanta.
SURFACE TEMPERATURES AND GLASSY STATE INVESTIGATIONS IN TRIBOLOGY, PART 3 Final Report
Scott S. Bair and Ward O. Winer Washington NASA Apr. 1980 85 p refs
(NASA-CR-3272) Avail: NTIS HC A05/MF A01 CSCL 20L

Research related to the development of the limiting shear stress rheological model is reported. Techniques were developed for subjecting lubricants to isothermal compression in order to obtain relevant determinations of the limiting shear stress and elastic shear modulus. The isothermal compression limiting shear stress was found to predict very well the maximum traction for a given lubricant. Small amounts of side slip and twist incorporated in the model were shown to have great influence on the rising portion of the traction curve at low slide-roll ratio. The shear rheological model was also applied to a Grubin-like elastohydrodynamic inlet analysis for predicting film thicknesses when employing the limiting shear stress model material behavior. K.L.

N80-20589*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
COMPUTER CIRCUIT CARD PULLER Patent Application
Ralph W. Sawyer and Bill Szwnalski, inventors (to NASA) Filed 12 Mar. 1980 11 p
(NASA-Case-FRC-11042-1; US-Patent-Appl-SN-129778) Avail: NTIS HC A02/MF A01 CSCL 13I

A handtool for facilitating the removal of printed circuit cards is described. The device is adapted to sit on spaced, parallel rail surfaces of a card rack having a plurality of printed circuit cards. The device includes a cylindrical bar adapted to sit on the rail surfaces of the rack, a blade projected radially from the bar adapted to be received beneath a card rail, and a handle affixed to the bar in diametric opposition to the blade for facilitating manipulation of the blade for unplugging and lifting the card at its rail. NASA

N80-20590*# National Aeronautics and Space Administration, Washington, D. C.
GRINDING AND POLISHING ARTICLES IN BULK: BURNISHING
Karl Schmotz Mar. 1980 22 p Transl. into ENGLISH from Galvanotechnik (West Germany) v. 63, no. 9, 15 Sep. 1972 p 818-827 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75774) Avail: NTIS HC A02/MF A01 CSCL 13H

Various processes and equipment used for burnishing different materials are discussed. Drum and vibration installations are considered, as are processing chemicals and additive materials used in the burnishing process. R.E.S.

N80-20591*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LUBRICATION OF ROLLING-ELEMENT BEARINGS
Richard J. Parker [1980] 26 p refs Proposed for presentation at Intern. Lubrication Conf., San Francisco, 18-21 Aug. 1980; sponsored by ASME and the Am. Soc. of Lubrication Engr.
(NASA-TM-81449; E-370) Avail: NTIS HC A03/MF A01 CSCL 13I

The lubrication of rolling element bearings is surveyed. Emphasis is on the critical design aspects related to speed, temperature, and ambient pressure environment. Types of lubrication including grease, jets, mist, wick, and through the race are discussed. The historical development, present state of technology, and the future problems of rolling element bearing lubrication are discussed. A.W.H.

N80-20592# Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE PARTICLE DYNAMICS OF TARGET PENETRATION Final Report
James Dehn Sep. 1979 109 p
(DA Proj. 1L1-61102-AH-43)
(AD-A077114; AD-E430331; ARBRL-TR-02188) Avail: NTIS HC A06/MF A01 CSCL 19/4

New approaches are proposed for describing some of the principal features of target penetration by a projectile in the ordnance velocity range. These features include the following observed facts: (1) curved trajectories including the possibilities of perforation, embedment or ricochet, (2) loss of mass by erosion, and (3) breakup of the projectile into sizable pieces. Each of the approaches proposed is illustrated by examples. In addition, a considerable amount of literature on the subject is reviewed in order to place these new approaches in context. After providing historical background on his topic, the author develops and illustrates his basic ideas concerning a constant mass penetrator. He then extends the theory to the case of a variable mass penetrator, and considers a model of projectile breakup. GRA

N80-20593# Army Armament Research and Development Command, Dover, N. J. Fire Control and Small Caliber Weapon Systems Lab.
DESIGN OF HELICAL COMPRESSION SPRINGS Final Report
Henry P. Swieskowski Aug. 1979 64 p refs
(AD-A077113; AD-E400353; ARSCD-TR-79002) Avail: NTIS HC A04/MF A01 CSCL 13/9

In this mathematical study on helical spring design, three basic types of load requirements are distinguished and treated individually: (1) the load at assembled height; (2) the load at minimum compressed height; and (3) the energy content of the spring. Conventional load and stress deflection formulas are modified by the replacement of dependent variables with independent values. The ratio of the final spring deflection over the working stroke is formulated to show the variation of the final stress with various required load-space conditions. Optimum design parameters are established to minimize the final operating stress value. Direct and simplified analytical design procedures are developed for round wire and rectangular wire compression springs. Also presented are nomographs for use as design aids and detailed numerical design examples. This study combines design characteristics and stress advantages of nested spring systems versus a single spring for equivalent load conditions. GRA

N80-20594# Grumman Aerospace Corp., Bethpage, N.Y.
HYDRAULIC DIAGNOSTIC MONITORING SYSTEM
31 May 1979 267 p
(Contract N62269-78-C-0041)
(AD-A077552; NADC-TR-76389-30) Avail: NTIS HC A11/MF A01 CSCL 13/7

The purpose of the Hydraulic Diagnostic Monitoring System (HYCOS) is to warn of impending failure of hydraulic system components by onboard sensors continuously monitoring failure-indicating parameters. The monitoring system consists of three basic types of sensors: analog, discrete, and fiber-optic. These sensors feed information to a self-contained, centrally located display panel through interface circuits that are easily accessible to ground maintenance personnel. The panel has circuit and system test capability which detects malfunctions of the display indicators, electronic equipment, and sensor circuits. Task 1 encompassed the design, development and procurement of hardware, sensors and microprocessors for two diagnostic monitoring systems. Task 2 installed one system on the F-14 a Hydraulic Simulator for system component reliability demonstrations. The task also covered simulated component failures and diagnostic system reaction. GRA

N80-20595# Aerospace Corp., El Segundo, Calif. Materials Sciences Lab.
COIL SPRING FAILURES IN AEROSPACE HARDWARE Interim Report
Steve W. Frost and Kenneth T. Kamber Nov. 1979 27 p refs
(Contract F04701-79-C-0080)
(AD-A077808; TR-0080-5950-01-2; TR-79-19) Avail: NTIS HC A03/MF A01 CSCL 13/9

The failures of coil springs used in aerospace hardware because of fatigue and stress corrosion are evidence that there are reliability problems with these springs. The obvious and not so obvious origins of these reliability problems are discussed here. GRA

N80-20598# Oak Ridge Y-12 Plant, Tenn.
INERTIA AND FRICTION WELDING OF ALUMINUM ALLOY 1100 TO TYPE 316 STAINLESS STEEL
M. A. Perkins Oct. 1979 25 p refs Revised
(Contract W-7405-eng-26)
(Y-2165-Rev) Avail: NTIS HC A02/MF A01

The inertia and friction-welding processes were evaluated for joining aluminum alloy 1100-H14 and Type 316 vacuum-induction melted, vacuum-arc remelted stainless steel. While both processes consistently produced joints in which the strength exceeded the strength of the aluminum base metal, 100 percent bonding was not reliably achieved with inertial welding. The deficiency points out the need for development of nondestructive testing techniques for this type of joint. Additionally, solid-state volume diffusion did not appear to be a satisfactory explanation for the inertial and friction-welding bonding mechanism. DOE

N80-20597# Babcock and Wilcox Co., Alliance, Ohio. Research and Development Div.
DEVELOPMENT OF AUTOMATED WELDING PROCESSES FOR FIELD FABRICATION OF THICK-WALLED PRESSURE VESSELS: ELECTRON BEAM METHOD Quarterly Report, 1 Jan. - 31 Mar. 1979
Charles M. Weber 1979 34 p
(Contract EF-77-C-01-2606)
(FE-2606-T1; QR-6) Avail: NTIS HC A02/MF A01

The development and demonstration of an electron beam welding procedure for welding 8-inch thick SA 387 Grade 22 Class 2 steel are reported. A total of 414 welds were made. Partial penetration welding procedures capable of producing defect free, 4 inch welds were developed in the horizontal position. Defect free partial penetration welds were made at vacuum pressures of up to 30 microns. Several 5-inch thick defect free welds were made in the horizontal position. Attempts to produce defect free partial penetration welds in the vertical position were unsuccessful. DOE

N80-20598# Oak Ridge Y-12 Plant, Tenn. Fabrication Systems Dept.
PULSE-WIDTH-MODULATED AMPLIFIER DRIVES FOR MACHINE TOOLS
W. E. Barkman Nov. 1979 10 p
(Contract W-7405-eng-26)
(Y/DX-02) Avail: NTIS HC A02/MF A01

The use of a dc servo controller to convert command and feedback information into an error signal that is used to drive a dc motor is discussed. The controller utilizes a summing technique that compares an input command voltage with a feedback voltage from an external transducer. The resultant error signal is applied to a linear or a switching servo amplifier. While the output of the linear amplifier may have the ideal representation of the desired drive signal, it does result in substantial power dissipation within the amplifier and requires forced air cooling for power ratings above 100 to 200 W. The switching amplifier avoids this problem by rapidly changing the state of its output stage from a conducting to a nonconducting condition, thereby minimizing the operation of the output stage in the high power dissipation region. The design and operation of the amplifier drive are described. DOE

N80-20599# Argonne National Lab., Ill. Chemical Engineering Div.
DECONTAMINATION OF METALS CONTAINING PLUTONIUM AND AMERICIUM
M. G. Seitz, T. J. Gerding, and M. J. Steindler Jun. 1979 57 p refs
(Contract W-31-109-eng-38)
(ANL-78-13) Avail: NTIS HC A04/MF A01

A conceptual design of a melt refining process to decontaminate plutonium- and americium-contaminated metals is described. The process includes single-stage refining of contaminated metals to produce a metal product which would have less than 10 nCi/g of TRU-element contamination. Two plant sizes were considered. The smaller conceptual plant processes 77 kg of metal per 8 hour period and may be portable. The larger one processes 140 kg of metal per 8 hour period, is stationary, and may be near the maximum size that is practical for a metal decontamination process. DOE

N80-20600# National Technical Information Service, Springfield, Va.
GAS BEARINGS, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1971 - Nov. 1979
Guy E. Habercom, Jr. Dec. 1979 286 p Supersedes NTIS/PS-78/1277; NTIS/PS-77/1122; NTIS/PS-16/0970; NTIS/PS-75/808; NTIS/PS-76/0969
(PB80-802499; NTIS/PS-78/1277; NTIS/PS-77/1122; NTIS/PS-76/0970; NTIS/PS-75/808; NTIS/PS-76/0969) Avail: NTIS HC $30.00/MF $30.00 CSCL 13I

The design, performance, and applications of gas bearings are investigated in these research reports. Gas bearing configuration, gas flow, lubrication, bearing loading, and bearing stability are among the parameters reviewed. This updated bibliography contains 279 abstracts, 16 of which are new entries to the previous edition. GRA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N80-20601 Pennsylvania State Univ., University Park.
INTERNAL QUALITY OF ALUMINUM DIE CASTINGS Ph.D. Thesis
Lester Wayne Garber 1979 255 p
Avail: Univ. Microfilms Order No. 8006003

The effects of experimental manipulations and random variations of several process variables on the internal quality of aluminum die castings are investigated. Particular consideration is also given to determine whether entrapped air or internal solidification shrinkage is the principal cause of the greatest volume of porosity within aluminum die castings. The independent variables in the experimental design are intensification pressure, fast shot plunger velocity, die temperature gradient, metal temperature in the holding furnace, and die open time. High levels of intensification pressure and low levels of fast shot plunger velocity are found to produce castings of better internal quality. Of the random variations tested, biscuit lengths and pressure-related variables are found to affect internal quality. Internal solidification shrinkage, and not entrapped air, is found to be the principal cause of the greatest volume of porosity within aluminum die castings. Dissert. Abstr.

N80-20602# Stanford Univ., Calif. Dept. of Operations Research.
BOUNDING THE RELIABILITY OF MULTISTATE SYSTEMS
David A. Butler Aug. 1979 38 p refs
(Contract N00014-75-C-0561)
(AD-A075579; TR-193) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report develops a number of upper and lower bounds for the reliability of multistate systems, that is, systems for which each component may exist in one of a finite number of states. These bounds are based on notions of multistate minimal paths and minimal cuts. The bounds are far more easily computed than the exact system reliability. In order to further reduce the computations required and obtain sharper bounds, a modular-decomposition-based bound is developed for multistate systems. GRA

N80-20603# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
COMMON CAUSE FAILURE ANALYSIS TECHNIQUES: A REVIEW AND COMPARATIVE EVALUATION
Dale M. Rasmuson, Gary R. Burdick, and James R. Wilson Sep. 1979 177 p refs
(Contract EY-76-C-07-1570)
(TREE-1349) Avail: NTIS HC A09/MF A01

Reviews and evaluations of selected common cause failure analysis (CCFA) techniques are presented for experienced reliability

analysts who are new to systems where common cause failures contribute significantly to the system reliability characteristics. General characteristics of a CCFA are discussed and suggestions for implementing each characteristic are given. A flow chart which summarizes and evaluates the references is presented. DOE

N80-20604# Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung e. V., Bremen (West Germany). Inst. fuer Angewandte Materialforschung.
REPORT ON THE ACOUSTIC EMISSION EXAMINATION OF GLASS-FIBER-REINFORCED PLASTIC PIPES
W. Brockmann and K. Wolitz Oct. 1979 18 p
(UCRL-Trans-11520) Avail: NTIS HC A02/MF A01

From the results reported, it can be concluded that acoustic emission analysis is suitable as a technique for quality control of high-pressure pipes, because it permits critical processes (fiber breaks) to be distinguished from noncritical processes (delamination, breaks between fibers) at pressure loads up to the rated load. If further tests with a larger number of test specimens can establish a statistically significant correlation between the proportion of fiber breaks below the rated pressure and the bursting pressure which actually occurs, it will be possible, by using acoustic emission analysis and test loads up to the rated pressure, to dispense with an individual test at double rated load, which in its own right can damage, beyond the critical point, a system designed for a load. The use of acoustic emission analysis thus leads to increased safety of the pipes. DOE

N80-20605# Hanford Engineering Development Lab., Richland, Wash. Materials Engineering Dept.
ACOUSTIC EMISSION: WHO NEEDS IT AND WHY?
J. C. Spanner May 1979 27 p refs Presented at the Intern. Conf. on Acoustic Emission, Anaheim, Calif., 10 Sep. 1979
(Contract EY-76-C-14-2170)
(HEDL-SA-1808-FP; CONF-790966-2) Avail: NTIS HC A03/MF A01

The growing industrial interest in acoustic emission is examined. Some of the inherent limitations of conventional nondestructive test methods are discussed, and several surveys of defects found during the manufacture and operation of pressure boundary components are reviewed. Acoustic emission offers potential for providing increased assurance of both initial and continued structural integrity. Furthermore, if acoustic emission is properly applied in conjunction with fitness-for-purpose criteria, it may be possible to reduce present manufacturing costs without compromising actual structural adequacy. DOE

N80-20606# Los Alamos Scientific Lab., N. Mex.
STATUS OF RADIOGRAPHIC STUDY, DEVELOPMENT, AND NEW APPLICATIONS IN THE LASL NONDESTRUCTIVE TESTING GROUP
L. E. Bryant, Jr. Oct. 1979 15 p
(Contract W-7405-eng-36)
(LA-UR-79-2648) Avail: NTIS HC A02/MF A01

Topics discussed include replacement of betatron with a racetrack microtron, development of tomography, cineradiography, and flash X ray applications. DOE

N80-20607# Nevada Automotive Test Center, Carson City.
NDT (NON-DESTRUCTIVE TEST)/ROAD CORRELATION Final Report
Henry C. Hodges and Henry C. Hodges, Jr. 18 Apr. 1979 19 p
(Contract DOT-HS-7-01589)
(PB80-106636; DOT-HS-805-034) Avail: NTIS HC A02/MF A01 CSCL 13F

Several nondestructive test (NDT) methods were compared and water coupled ultrasonics produced the most accurate and repeatable data for three dimensionally positioning tire anomalies. For the continuation of the evaluation of water coupled ultrasonics 75 recapped test tires were obtained, including bias, bias-belted and radial, and scheduled for 10,000 miles of highway durability. The tires, in general, only obtained one-third that mileage due to catastrophic failures and treadwear anomalies. These tires were NDT-inspected prior to test and after test to analyze the ability of water coupled ultrasonics to differentiate between those tire anomalies which lead to degraded road performance and those which do not. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N80-20608 Florida Univ., Gainesville.
ON THE THEORY OF CYCLIC VISCOPLASTICITY Ph.D. Thesis
Chian-Eong Yen 1979 260 p
Avail: Univ. Microfilms Order No. 8005513

A theory of cyclic viscoplasticity is developed to describe the observed rate- and history-dependent behavior of structural materials under complex loading conditions. It quantitatively accounts for the viscid effect, the anisotropic yield surface distortion, and the material behavior observed under cyclic loading conditions including cyclic hardening, cyclic softening, and the material memory of prior loading history. The theory includes a hardening rule, a rate-dependent flow rule, and an expression for the inelastic modulus of the quasi-static effective stress-effective inelastic strain curve. Computations are carried out for uniaxial random cyclic loading for type 304 stainless steel at elevated temperature and for simulations of experiments for pure aluminum under complex combined tension-compression and torsion loadings. Dissert. Abstr.

N80-20609 Michigan State Univ., East Lansing.
MEASUREMENT OF TRANSIENT RESPONSE OF A CENTRAL CRACK TO A TENSILE PULSE Ph.D. Thesis
Abdurahman Ahmed Sukere 1979 120 p
Avail: Univ. Microfilms Order No. 8006193

The behavior of a crack in a stress wave environment was investigated. The crack was approximated by electromachined slots in the center of thin aluminum specimens. A tensile impact apparatus was developed for generating a plane tensile pulse with a ramp function profile. Dynamic displacements along the crack surface were measured using a laser interferometric displacement gage. The data were analyzed within the bounds of linear elastic mechanics to estimate the dynamic stress intensity factor. The experimental results for the dynamic crack displacements were found to oscillate, a phenomena attributed to the cancellation and reinforcement of the incident waves by the various scattered waves. Dissert. Abstr.

N80-20610 Purdue Univ., Lafayette, Ind.
FINITE-ELEMENT ANALYSIS OF PROBLEMS INVOLVING STRESS SINGULARITIES Ph.D. Thesis
Wen-Sheng Chan 1979 206 p
Avail: Univ. Microfilms Order No. 8005839

Singular finite elements that contain a square root type of stress singularity were developed for the analysis of crack problems. Several static crack problems, i.e., center, single edge, and double edge cracks, were solved and compared with an available analytical solution. In the dynamic case, the Newmark method was used to integrate the time variable. Both stationary cracks subjected to dynamic loadings and cracks moving with a constant velocity were considered. For the moving crack problems, the dynamic stress intensity factor was computed for an elastic strip subjected to prescribed boundary displacements as well as a simple tension. An 8 node quadrilateral finite element was developed for the lap joint analysis. Effects of the overlap length, and ratio of adherend thickness to adhesive thickness, and clamping forces applied at the edges of overlapping were investigated. Dissert. Abstr.

N80-20611 Tennessee Univ., Knoxville.
FRACTURE MECHANICS OF BI-MATERIAL INTERFACE CRACKS Ph.D. Thesis
Setunath Anna Swamy 1979 132 p
Avail: Univ. Microfilms Order No. 8005428

The behavior of bimetallic interface cracks was investigated. A plate composed of two dissimilar materials bonded together along a straight line containing a center crack was studied. The problem represented an idealization of an adhesive joint or a composite structure with an interfacial flaw or crack. Solutions

obtained using three different approaches were compared in order to develop a recommended procedure for analyzing interface crack problems. The first method was based on the hybrid crack tip element method. Standard eight node isoparametric elements, with modifications to account for singularity, were also used to analyze the problem. Two distinct techniques using this general approach were studied - one based on the mapping technique and the other based on the displacement technique. The mapping technique involved the use of two dimensional isoparametric elements with the midside nodes shifted to the quarter point location. The displacement technique involved the use of two dimensional isoparametric elements with numerically integrated shape functions. Dissert. Abstr.

N80-20612 Wisconsin Univ. - Madison.
A DIAGONALLY DOMINANT SOLUTION FOR THE CYLINDER END PROBLEM AND A NON-AXISYMMETRIC ELASTICITY SOLUTION FOR A TRUNCATED SPHERICAL DOME Ph.D. Thesis
Terry Dale Gerhardt 1979 181 p
Avail: Univ. Microfilms Order No. 8001609

A method for the elasticity solution of the cylinder problem with axisymmetric torsionless end loading is presented. Consideration is given to the specification of arbitrary stresses or displacements on the end of a semi-infinite cylinder with a stress free lateral surface. Utilizing the Papkovich-Neuber potentials, a solution to this problem is obtained in the form of a nonorthogonal eigenfunction expansion. The expansion coefficients must be determined from an infinite system of linear algebraic equations. A Galerkin formulation is presented which makes this system of equations diagonally dominant, allowing the precise calculation of the eigenfunction coefficients regardless of how many equations are kept before truncation. This solution is shown to yield an accurate calculation of cylinder stresses and displacements. A nonaxisymmetric solution for Navier's equations in spherical coordinates is obtained through a direct method, rather than the usual Papkovich-Neuber approach. The solution is specialized to solve the problem of a truncated spherical dome with a closed top. Dissert. Abstr.

N80-20613 Pennsylvania State Univ., University Park.
VIBRATION OF PLATES OF VARIOUS GEOMETRIES Ph.D. Thesis
Earl George Williams 1979 157 p
Avail: Univ. Microfilms Order No. 8006070

Point-driven, flat, thin aluminum plates of various geometries with free boundaries were studied. A theory which allows the mean of the driving point admittance to be predicted over a wide frequency range at any point on these plates was used. The prediction was compared to the experimentally determined admittance. The expected minimum and maximum variations about this mean were predicted and compared to the experimental data over a broad frequency range. Measured loss factors for these free plates were used in the theoretical models. The actual admittance versus frequency for a center driven rectangular plate was predicted using a mode sum technique and compared to measured data. A simple algebraic formula was used to predict the resonance frequencies of the rectangular and square plates with free boundaries. Dissert. Abstr.

N80-20614 Wisconsin Univ. - Madison.
A DIFFERENTIAL POPULATION SYNTHESIS APPROACH TO MASS SEGREGATION IN M92 Ph.D. Thesis
William John Tobin 1979 148 p
Avail: Univ. Microfilms Order No. 8004747

Spectra obtained with a intensified Reticon scanner are presented of 26 low metal stars and of the center and one quarter intensity positions of M92. Spectral coverage is from 390 to 870 nm with resolution better than 1 nm in the blue and 2 nm in the red. Individual pixel signal to noise is about 100. Dwarf features are notably absent from the M92 spectra. Numerical estimates of 36 absorption features are extracted from every spectrum, as are two continuum indices. Mathematical models are constructed describing each feature's dependence on stellar color, luminosity, and metal content and then used to estimate the metal content of 6 of the stars for which the metal content is not known. For 10 features reliably measured in M92's center and edge a mass segregation sensitivity parameter is derived from each feature's deducted luminosity dependence. Dissert. Abstr.

N80-20615 Tufts Univ., Medford, Mass.
CLOSED CELL STRUCTURES USING TRIANGULAR PLATES Ph.D. Thesis
Henry Robert Poydar 1979 131 p
Avail: Univ. Microfilms Order No. 8006712

A method is described by which closed cell structures of single curvature may be constructed using triangular folded plate elements of equal size. When viewed in the transverse plane, these structures are seen to be portions of a regular polygon. Methods for obtaining matrices for nodal coordinates and element connectivity are described. Schlegel diagrams are introduced as a way to help visualize connectivity. This information is used to construct a 350 pound, portable, plywood and aluminum prototype structure which is 9.46 feet high, 8.00 feet wide, and 8.43 feet long. A load was applied along the centerline of the crown of the structure and the nodal displacements measured. The measured displacements were compared to computed values. It is shown that small structures may be constructed using the prescribed method and that their structural response to imposed loads may be predicted by the analysis of a representative plane frame and the application of an appropriate amplification factor. Dissert. Abstr.

N80-20616 Cornell Univ., Ithaca, N. Y.
TIME-DEPENDENT INELASTIC ANALYSIS BY THE BOUNDARY ELEMENT METHOD AND THE FINITE ELEMENT METHOD Ph.D. Thesis
Maheshchandra Amritlal Morjaria 1979 91 p
Avail: Univ. Microfilms Order No. 8003956

Numerical schemes for solution of problems of time-dependent inelastic deformation in metallic bodies using the boundary element method and the finite element method are presented. The formulations utilize combined creep-plasticity constitutive theory with state variables to model material behavior. The boundary element method is applied to general plane stress/strain and plate bending problems. The finite element method is applied to plane stress/strain as well as axisymmetric problems. Numerical solutions for some problems are obtained to illustrate the procedures and their versatility. It is concluded that both the formulations are very general and can be easily applied to problems with complicated geometrics and loading histories. However, with regards to solution time and solution accuracy, the boundary element method is somewhat more efficient than the finite element method for this class of problems. Dissert. Abstr.

N80-20617 North Carolina State Univ. at Raleigh.
AN INVESTIGATION OF RIB STIFFENED HYPERBOLIC COOLING TOWER UNDER STATICAL LOADS USING DISCRETE FIELD AND GALERKIN FINITE ELEMENT METHODS Ph.D. Thesis
Debasish Kumar Roy 1979 171 p
Avail: Univ. Microfilms Order No. 8005566

A rational analysis for rib stiffened hyperbolic shells of revolution is developed. The discrete field macro approach is applied and intended to take advantage of the discretely symmetric structural configuration in the circumferential direction for any axisymmetric shell of revolution. The resulting mathematical model covering the variation in the meridional direction is developed using the finite element numerical technique. The rib-shell interaction is enforced through a set of field displacement compatibility equations by matching rib and shell displacements at rib-lines. The Galerkin finite element method is used to find the rib and shell displacements. A computer program is written for the purpose of investigating either a hyperbolic curved rib, shell of revolution or rib stiffened cooling tower when subjected to statical loads. Several heuristic rib stiffened cooling towers are studied for various load cases. Dissert. Abstr.

N80-20618 Purdue Univ., Lafayette, Ind.
SINGULAR FINITE ELEMENT SHAPE FUNCTIONS IN ESTIMATING STRESS INTENSITY FACTORS Ph.D. Thesis
George Hans Staab 1979 129 p
Avail: Univ. Microfilms Order No. 8005945

The general procedure for extracting the stress intensity factor from the finite element solution is discussed. This procedure

is shown to be applicable to mixed mode analysis, such as the oblique edge crack problem. The various methods available for estimating the stress intensity factor are examined and shown to produce acceptable results, which depend on the manner in which the stress intensity factor is estimated. Two shape functions, representing both a simple and a complex displacement field, are used to analyze several problems of practical importance. Each function is shown to accurately estimate the stress intensity for these problems, thus providing further verification that the number of terms used to define the singular element displacement field is of minimal importance. The problems analyzed are the oblique edge crack, beam bending, a split beam, and two bi-material problems. The problem of an interfacial crack along the bond line of two dissimilar media is found to be a case of limited applicability for the shape functions considered.
Dissert. Abstr.

N80-20619*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ON THE NONLINEAR DEFORMATION GEOMETRY OF EULER-BERNOULLI BEAMS
Dewey H. Hodges, Robert A. Ormiston, and David A. Peters Apr. 1980 57 p refs
(NASA-TP-1566; A-7985; AVRADCOM-TR-80-A-1) Avail: NTIS HC A04/MF A01 CSCL 20K

Nonlinear expressions are developed to relate the orientation of the deformed beam cross section, torsion, local components of bending curvature, angular velocity, and virtual rotation to deformation variables. The deformed beam kinematic quantities are proven to be equivalent to those derived from various rotation sequences by identifying appropriate changes of variable based on fundamental uniqueness properties of the deformed beam geometry. The torsion variable used is shown to be mathematically analogous to an axial deflection variable commonly used in the literature. Rigorous applicability of Hamilton's principle to systems described by a class of quasi-coordinates that includes these variables is formally established. K.L.

N80-20620*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NONLINEAR STATIC TPS ANALYSIS
Jerrold M. Housner and Ramon Garcia Mar. 1980 20 p refs
(NASA-TM-81785) Avail: NTIS HC A02/MF A01 CSCL 20L

A nonlinear analysis which includes the effect of mismatch and filler bar was developed to predict the strain isolator pad reuseable surface insulation through-the-thickness interface stresses. Parametric studies were conducted for simulated shock loading on square tiles. Expected loads on an actual tile were also studied. The results indicate that when no mismatch is present, linear solutions tend to give nonconservative maximum stresses relative to the nonlinear solutions. When mismatch is present, the linear maximum stresses are only conservative at low load levels and highly nonconservative at high load levels. Although the presence of filler bar reduces maximum tensile stresses in some cases, it does not appear that the nominal dimension filler bar can reduce the nonlinear stress to a level at which the linear solution becomes conservative relative to the nonlinear solution. Moreover, on an outboard trailing edge elevon tile at descent with +20 deg flap, the linear analysis is 49% nonconservative relative to the nonlinear analysis with filler bar.
K.L.

N80-20621*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
USE OF TWO-DIMENSIONAL TRANSMISSION PHOTOELASTIC MODELS TO STUDY STRESSES IN DOUBLE-LAP BOLTED JOINTS: LOAD TRANSFER AND STRESSES IN THE INNER LAP Progress Report
Michael W. Hyer Mar. 1980 65 p refs
(Grant NsG-1621)
(VPI-E-80-9) Avail: NTIS HC A04/MF A01 CSCL 20K

The determination of the stress distribution in the inner lap of double-lap, double-bolt joints using photoelastic models of the joint is discussed. The principal idea is to fabricate the inner lap of a photoelastic material and to use a photoelastically sensitive material for the two outer laps. With this setup, polarized light transmitted through the stressed model responds principally to the stressed inner lap. The model geometry, the procedures for making and testing the model, and test results are described.
K.L.

N80-20622# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
THERMO-ELASTIC-PLASTIC STRESSES IN HOLLOW CYLINDERS DUE TO QUENCHING
J. D. Vasilakis and P. C. T. Chen Oct. 1979 23 p refs Presented at the 25th Conf. of Army Mathematicians, Baltimore, 6-8 Jun. 1979
(DA Proj. 1L1-61101-A-91A)
(AD-A077109; ARLCB-TR-79025) Avail: NTIS HC A02/MF A01 CSCL 20/11

A hollow cylindrical tube rapidly quenched for the purpose of developing a high strength material structure is analyzed. The quenching creates severe thermal stresses early in the quenching cycle while later the material transformation by virtue of a volume change in the transformed material causes large transformation stresses. The transient temperature distributions and the elastic treatment of the stresses has been treated previously. The present work is an attempt to consider the thermo-elastic-plastic aspects of the problem. The von Mises' yield criterion and the Prandtl-Reuss stress strain relations are used. Results are calculated based on a new finite difference approach. GRA

N80-20623# Systems Research Labs., Inc., Dayton, Ohio.
AN EVALUATION OF FOUR CURRENT MODELS TO PREDICT THE CREEP-FATIGUE INTERACTION IN RENE 95 Technical Report, Jan. 1977 - Aug. 1978
Henry L. Bernstein Jun. 1979 111 p refs
(Contract F33615-76-C-5191; AF Proj. 7351)
(AD-A077168; SRL-6909-TR; AFML-TR-79-4075) Avail: NTIS HC A06/MF A01 CSCL 11/6

Four current models for the creep-fatigue interaction were evaluated for their ability to predict fatigue behavior at 1200 F (650 C) of thermochemically processed Rene 95--an advanced nickel-base superalloy used for turbine disks. These models are the Strainrange-Partitioning Model, the Frequency-Separation Model, the Ostergren Model, and the Damage-Rate Model. A series of strain controlled fatigue tests was conducted to evaluate these models. These tests consisted of continuously cycling tests at two different frequencies, various types of strain-hold tests, and dual-rate continuously cycling tests. These fatigue tests were divided into two groups--baseline tests and verification tests. The baseline tests were used to determine the constants in the models and the correlation ability of the models. The verification tests were used to determine the predictive ability of the models. The best correlation of the baseline tests was to within a scatter band of plus or minus 3.6 and was achieved by the Frequency-Separation Model and the Ostergren Model. The other two models had scatter bands greater than plus or minus 5. The best prediction of the verification tests was to within a factor of plus 5.2 and was achieved by the Ostergren Model. The other models predicted the verification tests from factors of plus or minus 6.1 to plus or minus 18. Each of the models consistently overpredicted or underpredicted the lives of certain types of tests that form the data base. Based upon the results of this study, it was concluded that these models in their present form could not adequately predict the fatigue life of Rene 95 at 1200 F (650 C). GRA

N80-20624# Army Materials and Mechanics Research Center, Watertown, Mass. Mechanics of Materials Div.
ON THE LOAD DISPLACEMENT RELATION FOR A CRACKED RECTANGULAR SPECIMEN WITH CONSTRAINED ENDS Final Report
Oscar L. Bowie and Francis I. Baratta Jul. 1979 17 p refs Submitted for publication
(DA Proj. 1L1-62105-AH-84)
(AD-A075527; AMMRC-TR-79-46) Avail: NTIS HC A02/MF A01 CSCL 20/11

Relations are presented between the net force, the end displacement, and the stress intensity factor for cracked rectangular panels subjected to uniform displacement. Two configurations are considered: an edge-cracked panel and a

center-cracked panel. If the stress intensity factor is already known in terms of the normal displacement, then the resulting formulation allows the determination of that stress intensity in terms of the applied load and vice versa. GRA

N80-20625# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

THE PREDICTION OF MASS LOADED NATURAL FREQUENCIES AND FORCED RESPONSE OF COMPLEX, RIB-STIFFENED STRUCTURES M.S. Thesis

L. B. Glensek Dec. 1979 149 p refs

(AD-A079856; AFIT/GAE/AA/79D-5) Avail: NTIS HC A07/MF A01 CSCL 20/4

An experimental investigation was conducted to determine the validity of an algorithm developed by Whaley (Ref 14) to approximate the natural frequencies of a complex structure under arbitrary mass loading conditions, when only the unloaded natural frequency and mode shape data is known. The chosen test specimen was a curved, rib-stiffened panel from a C-141 Starlifter, aircraft. The panel was suspended from the ceiling by bungy cords and tested in an unloaded configuration and nine separate mass loaded configurations. Then using only unloaded data the generalized mass and generalized stiffness for each mass loaded configuration were computed, and the natural frequencies for each configuration were computationally predicted using the aforementioned algorithm. The theoretical and experimental results were then compared to determine the amount of error incurred in the approximation technique. The theory of how to ultimately determine the overall forced response of the specimen was discussed and an error model was developed to enable an examination of the reliability of the algorithm in predicting forced response. Recommendations concerning future test procedures, areas requiring further study, and the use of the algorithm were made. GRA

N80-20626# Wisconsin Univ. - Madison. Mathematics Research Center.

ENERGY RELEASE RATE CALCULATIONS FOR INTERFACE EDGE CRACKS BASED ON A CONSERVATION INTEGRAL Summary Report

A. Nachman (Old Dominion Univ.) and J. R. Walton (Texas A and M Univ., College Station) Nov. 1979 14 p refs

(Contracts DAAG29-75-C-0024; F49620-79-C-0076; Grant AF-AFOSR-3290-77)

(AD-A079723; MRC-TSR-2017) Avail: NTIS HC A02/MF A01 CSCL 12/1

A certain conservation integral, the so called M-integral, recently exploited by L. B. Freund in the calculation of stress intensity factors for cracks in homogeneous elastic media, is applied to the calculation of energy release rates for interface edge cracks. Specifically, for an edge crack along the interface between two elastic wedges of different opening angles and dissimilar elastic properties, and that is subjected to point loads at the apex, a relation is derived among the length of the crack, the energy release rate of the crack, the applied loads, the wedge angles and the material parameters. GRA

N80-20627# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

EFFECT OF IMPERFECTIONS ON THE COLLAPSE OF RECTANGULAR PLATES USING VARIATIONAL CALCULUS M.S. Thesis

Lyle G. Peck Dec. 1979 73 p refs

(AD-A079905; AFIT/GAE/AA/79D-14) Avail: NTIS HC A04/MF A01 CSCL 11/4

An analysis is made of the effect of initial imperfections in geometry on the collapse of simply-supported rectangular plates. A Reissner-type variational principle is employed to evaluate the load versus lateral displacement of elastic, elastic-plastic and orthotropic plates subject to compressive loading along two edges. Imperfection size and shape, plate thickness and aspect ratio, and for orthotropic material, the ply orientation is examined. The results indicate that the load-displacement curve is sensitive to the initial imperfection, particularly for elastic-plastic materials. The effect of plate size and aspect ratio are similar for all the plates considered with the collapse stresses higher for elastic plates than for elastic-plastic plates. The effect of plasticity becomes insignificant for thin plates when compared with plates with elastic properties. In general, it can be stated that the imperfection function determines the plate's collapse load. For orthotropic plates the effect of ply orientation is significant at aspect ratios less than 1 but relatively insignificant at higher values when comparing the minimum collapse stresses. The difference is dependent upon the magnitude of the ratio of Young's moduli in the major material axes. GRA

N80-20628# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

ANALYTICAL/EXPERIMENTAL INVESTIGATION OF THE INSTABILITY OF COMPOSITE CYLINDRICAL PANELS M.S. Thesis

Marvin L. Becker Dec. 1979 89 p

(AD-A079850; AFIT/GAE/AA/79D-3) Avail: NTIS HC A05/MF A01 CSCL 11/4

An analytical and experimental program was conducted to study the instability of 8-ply laminated cylindrical panels (graphite-epoxy) subjected to an axial compressive loading. The analysis included three different ply orientations, five different boundary conditions on the vertical edges, and three different panel sizes. The analytical buckling loads were obtained by using the linear bifurcation branch of the STAGS-C computer code, and several nonlinear collapse analyses were also made on selected configurations. The experimental tests were conducted by the Air Force Flight Dynamics Laboratory using a specially designed test fixture. Relatively good agreement was obtained between the analytical and experimental buckling loads, particularly when the nonlinear collapse load was used. The linear bifurcation results were 11 - 28% higher than the nonlinear results, indicating that the nonlinear effects in circular composite panels are important. The boundary conditions (especially w and v) had the greatest influence on the buckling load, followed by the aspect ratio and finally the ply orientation. The (+ or - 45)2s panels exhibited an unusually large increase in the buckling load when the aspect ratio was small and the in-plane displacements were restrained at the edges. GRA

N80-20629# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

COLUMN BUCKLING OF ISOTROPIC AND COMPOSITE BEAMS USING A TRUNCATED FOURIER SERIES M.S. Thesis

J. Louis Insprucker, III Dec. 1979 139 p refs

(AD-A079862; AFIT/GA/AA/80M-2) Avail: NTIS HC A07/MF A01 CSCL 13/13

A trigonometric approach to finite difference calculus was applied to solve for beam buckling loads using a virtual work method. The trigonometric equation, a truncated Fourier series, permitted varying the buckling load by adjusting a wavelength parameter. Values for the buckling load of a variety of beams - uniform, homogeneous, variable and discontinuous inertias, composite - were found under a wide range of boundary conditions. An optimization scheme was used which determines the critical load by locating the intersection of two buckling load curves. The method is accurate as long as points of interest - maximum inertia, discontinuities - are modeled by the nodal arrangement. The trigonometric approach provided improved accuracy over the conventional approach for a wide range of wavelengths. For an infinite value of the wavelength, the trigonometric approach converges to the conventional one. A variable mesh designed to concentrate nodes about points of interest was found to be relatively ineffective when compared to a uniform mesh. Composite materials were modeled using an equivalent flexural rigidity. GRA

N80-20630# California Univ., Berkeley. Dept. of Mechanical Engineering.

RIGID-PLASTIC FINITE-ELEMENT ANALYSIS OF PLASTIC DEFORMATION IN METAL-FORMING PROCESSES Progress Report, May 1978 - May 1979

C. C. Chen and Shiro Kobayashi Aug. 1979 141 p refs

(Contract F33615-77-C-5111; AF Proj. 2418)

(AD-A078987; AFML-TR-79-4105) Avail: NTIS HC A07/MF A01 CSCL 13B

Metal-forming processes of extrusion, drawing, ring compression, and closed-die forging were analysed by the rigid-plastic finite-element method. According to the individual problem

characteristics, the method was modified in order to deal with the steady-state configurations of the extrusion and drawing problems, the neutral flow point (or region) problems of ring compression, and the complexity in geometric changes of the closed-die forging problems. The present investigation is a complete study of the axisymmetric steady-state extrusion and drawing processes, including multipass extrusion and drawing. Detailed deformation mechanics were revealed, showing the influence of the previous deformation history on the flow pattern in the current pass. To solve the neutral flow problems in ring compression, a variational formulation was developed for the case where the frictional stress is dependent on the relative velocity at the die-workpiece interface. The finite-element solutions of ring compression were then obtained under various friction conditions for several materials. Some of the results were compared with the approximate theoretical solutions and experimental results. It was concluded that this modified finite-element scheme does provide a useful tool for the analysis of neutral flow problems and for industrial applications. The closed-die forging problems are characterized by very complex geometries, large rigid portions, and rapid changes in velocity fields. GRA

N80-20631# Bristol Univ. (England). Physics Lab.
STATES OF STRESS AND STRAIN IN ADHESIVE JOINTS, INCLUDING PHOTOELASTIC IMAGING OF DEFECTS IN ADHERENDS Interim Scientific Report, 30 Sept. 1977 - 30 Sep. 1979
J. P. Sargent 30 Nov. 1979 52 p refs Sponsored in part by European Office of Aerospace Research
(Grant AF-AFOSR-3448-77; AF Proj. 2307)
(AD-A079515; AFOSR-79-1359TR) Avail: NTIS HC A04/MF A01 CSCL 11/1

Water migration across the thin epoxy resin layer in model adhesive joints causes strongly inhomogeneous swelling. The swelling is the principal cause of stress systems which are being examined by analysis of the pattern of Newton's rings formed between a glass cover slip and an optical flat. Enhancement of water migration by normal stresses fracture mechanics test piece, designed to investigate water uptake by adhesives, is reported. Photoelastic imaging of ultrasonic waves can be utilized to investigate defects in opaque solids. Instead of using a piezoelectric detector, the reflected sound from a defect is actually observed in a visualizing block of quartz, after propagating from the specimen to the block across an acoustic coupling. Experiments and a computer model are described. GRA

N80-20632# Sandia Labs., Albuquerque, N. Mex.
BIAS ERRORS IN A RANDOM VIBRATION EXTREMAL CONTROL STRATEGY
D. O. Smallwood and D. L. Gregory 1979 18 p ref Presented at the Shock and Vibration Symp., Colorado Springs, Colo., 16 Oct. 1979
(Contract EY-76-C-04-0789)
(SAND-79-1222; CONF-791053-1) Avail: NTIS HC A02/MF A01

The theoretical basis for an extremal control strategy in random vibration testing is discussed. Except for special cases this strategy results in bias errors. Formulas for estimating the bias are given, and methods for minimizing the errors are suggested. It is concluded that a sequential averager should not be used for this control strategy as its use will result in an unknown bias error. DOE

N80-20633# Akron Univ., Ohio.
EXPERIMENTAL STUDY OF CAP AND THICKNESS INFLUENCE ON THE VIBRATION RESPONSE AND DAMPING OF FLEXIBLE FLUID-COUPLED COAXIAL CYLINDERS
Mamerto Chu, Samuel Brown (Babcock and Wilcox Co., Akron, Ohio), Brian Lieb (Babcock and Wilcox Co., Akron, Ohio), and Joseph Lestingi (General Motors Corp., Flint, Mich.) 1979 52 p refs
(Contract EY-76-C-15-2395)
(CONF-790615-14) Avail: NTIS HC A04/MF A01

The response of a set of coaxial cylinders with water in the annulus is studied. The effects of cylinder thickness and the fluid filled annulus gap size on the resonant frequencies and mode shapes of the cylinders are presented; also included is an evaluation of damping for selected gaps and cylinder thicknesses. Details of the experiment setup and procedures are outlined. DOE

N80-20634# General Atomic Co., San Diego, Calif.
DISTRIBUTION OF STEADY STATE TEMPERATURES AND THERMOELASTIC STRESSES IN CYLINDRICAL SHELL WITH INTERNAL HEAT GENERATION AND COOLED ON BOTH SIDES OR ONLY ON ONE SIDE
Gilbert B. MeleseDHospital Oct. 1979 80 p
(Contract DE-AT03-76ET-35300)
(GA-A-15509) Avail: NTIS HC A05/MF A01

General expression for steady state temperatures and elastic thermal stress distribution are derived for a hollow fuel element cooled on both sides. The main simplifying assumptions consist of one dimensional heat transfer and a single medium. Dimensionless numerical results are plotted in the case of uniform internal heat generation and for constant thermal conductivity. Solid rods and flat plates are treated as special cases. As could be expected, cooling on both sides rather than on only one side, leads to significant reduction in maximum fuel temperature and thermal stresses for a given power density, or to a significant increase in power density for either given maximum temperature drop in the fuel or for maximum tensile thermal stress. DOE

N80-20635# Rochester Univ., N. Y.
MATERIALS AND MECHANICS OF RATE EFFECTS IN BRITTLE FRACTURE Progress Report, Oct. 1978 - Oct. 1979
S. J. Burns Oct. 1979 19 p
(Contract EY-76-S-02-2422)
(COO-2422-22) Avail: NTIS HC A02/MF A01

A thermodynamic formulation for a crack driving force was experimentally used in linear elastic fracture mechanics, elastic plastic fracture mechanics and creep fracture. In linear elastic and elastic plastic fracture mechanics, mechanical stability criteria are established from the load versus the load point displacement in two test specimens that differ only in crack area. These tests were also used to measure the fracture toughness in several heat treated steels. Creep cracking of PMMA shows that there is a sharp transition to unstable fracture in a plot of the log of the steady state crack velocity versus the crack driving force at several selected temperatures. In addition, it is shown that the athermal crack driving force is independent of rate and temperature. A method for electronically recording the crack driving force versus the crack area was used on double cantilevered beam specimens. Temperature and crack rate dependences were measured near the ductile to brittle transition temperature in a low carbon steel. DOE

N80-20636# Massachusetts Univ., Amherst.
DYNAMIC BUCKLING OF A RIGID-PLASTIC CYLINDRICAL SHELL: A SECOND ORDER DIFFERENTIAL EQUATION SUBJECT TO FOUR BOUNDARY CONDITIONS Final Report
K. Zak, M. A. Veluswami, and G. Horvay 1979 23 p refs
(Contract EY-76-S-02-4122)
(COO-4122-29) Avail: NTIS HC A02/MF A01

Three methods of solutions are considered: (1) power-series expansion (in conjunction with Pade approximants); (2) cosine-series solution, and its pair obtained by the variation of parameters method; and (3) pseudo-Hill analysis. But only method no. 1 is carried to completion, including a numerical confirmation that, for the aluminum test shell of Vaughan-Florence, the results coincide with those of Horvay-Veluswami-Stockton, based on time-consuming (and expensive) numerical forward integration. Solution method no. 2 is stopped short of numerical calculations; and method no. 3 is outlined in its principal features. Comments on post-buckling behavior are included. DOE

N80-20637# Massachusetts Univ., Amherst. Dept. of Civil Engineering.
EXTENSION OF THE VAUGHAN-FLORENCE ANALYSIS OF DYNAMIC BUCKLING OF A RIGID-PLASTIC CYLINDRICAL SHELL
G. Horvay and M. A. Veluswami 1979 21 p refs
(Contract EY-76-S-02-4122)

(CDO-4122-28) Avail: NTIS HC A02/MF A01

The results of the HVS analysis based on the full equation are compared with those of the VF analysis, for a steel core support barrel representative of industrial nuclear powerplant practice. It is found that the decrease in criticality is not as spectacular as it is for the aluminum test shell of VF. DOE

42 GEOSCIENCES (GENERAL)

N80-20638# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

REPORTS ON CARTOGRAPHY AND GEODESY. SERIES 1: ORIGINAL REPORT NO. 73 [NACHRICHTEN AUS DEM KARTEN UND VERMESSUNGSWESEN. REIHE 1: ORIGINALBEITRAEGE HEFT NR. 73]

1977 246 p refs In GERMAN Original contains color illustrations

(Rept-73) Avail: NTIS HC A11/MF A01

Papers describing the work of the Institute for the past 25 years include a description of the satellite observation station Wettzell. Geodetic data collection from Doppler and laser distance measurements, from altimeter and gravimetric evaluations, from the study of earth tides and photogrammetry are discussed, along with the cartographic representation of these data. For individual titles, see N80-20639 through N80-20673.

N80-20639# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

THE 25 YEARS AT THE INSTITUTE FOR APPLIED GEODESY [25 JANRE INSTITUT FUER ANGEWANDTE FEODAESIE (1952-1977)]

Rudolf Foerstner *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 7-37 refs In GERMAN (For primary document see N80-20638 11-42)

Avail: NTIS HC A11/MF A01

A chronological review of the important events since the foundation of the Institute 25 years ago is presented. The various phases of its organization and its relationship with other institutions are described. The goals fixed at the different stages of the IFAG's development in geodesy, mapping, and photogrammetry are examined. Author (ESA)

N80-20640# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

A SURVEY OF THE GEODETICAL WORK OF THE IFAG FROM 1952-1977 [EIN UEBERBLICK UEBER DIE GEODAETISCHEN ARBEITEN DES IFAG (ABT. 2 DES DGFI) VON 1952-1977] c46

Hermann Seeger, Rudolf Brein, Dieter Ehlert, Dieter Lelgemann, Klemens Nottarp, Bernd Richter, and Gerhard Soltau *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 39-51 In GERMAN (For primary document see N80-20638 11-42)

Avail: NTIS HC A11/MF A01

Survey of the 25 years of geodetical research undertaken by the IFAG is presented. The improvement of the triangulation network and geoid determination, research on gravimetry and Earth tides, and the exploitation of data from geodetic satellites are described and future projects stated. Author (ESA)

N80-20641# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

THE SATELLITE STATION WETZELL [DIE SATELLITENBEOBACHTUNGSSTATION WETTZELL] c14

Hermann Seeger *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 53-62 refs In GERMAN (For primary document see N80-20638 11-42)

Avail: NTIS HC A11/MF A01

The observation station Wettzell was created in collaboration with other institutes to modernize the research techniques of the IFAG in geodesy and geodynamics. The conception, realization, and installation of the Institute are described, and the technical devices camera, and a third generation laser ranging system.

Author (ESA)

N80-20642# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

SFB 78/IFAG PROJECTS FOR LASER MEASUREMENT OF DISTANCES TO SATELLITES [UEBER VORHABEN DES SFB 78/IFAG ZUR LASERENTFERNUNGSMESSUNG NACH SATELLITEN] c38

Klemens Nottarp, Hermann Seeger, and Peter Wilson *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 63-72 refs In GERMAN (For primary document see N80-20638 11-42)

Avail: NTIS HC A11/MF A01

First and third generation pulsed laser measurement systems for satellite positioning are described, and the contribution of the IFAG to the development to these systems is reported. The systems are given with emphasize on the latter's neodymium-yag lasers. Precision reached in satellite geodesy is higher than with photographic positioning techniques. Author (ESA)

N80-20643# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

CONTRIBUTIONS OF THE SFB 78/IFAG TO DOPPLER MEASUREMENTS FOR SATELLITE POSITIONING [DIE ARBEITEN DES SFB 78/IFAG AUF DEM GEBIET DER DOPPLERMESSUNGEN NACH SATELLITEN] c17

Peter Wilson and Hermann Seeger *In its* Rept. on Cartography and Geodesy. Ser. 1. Original Rept. No. 73 1977 p 73-80 refs In GERMAN (For primary document see N80-20638 11-42)

Avail: NTIS HC A11/MF A01

Microwave Doppler measurements of artificial satellite distances, investigated by the IFAG, are presented. With the support of the Navy Navigation Satellite System, geocentric positions as well as their narrow variation due to polar movement are determined. Observations achieved in collaboration with European tracking stations are reviewed and the technical instrumentation is detailed. Author (ESA)

N80-20644# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

CONTRIBUTIONS TO THE UTILIZATION OF ALTIMETER DATA [ARBEITEN ZUR NUTZUNG VON ALTIMETERDATEN] c46

Dieter Lelgemann *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 81-85 refs In GERMAN (For primary document see N80-20638 11-42)

Avail: NTIS HC A11/MF A01

The geodetic use of high precision altimeters is examined. Radars placed in artificial satellites contribute to the determination of a global coordinate system and the knowledge of the characteristics of the graviational field. The Hudson Bay project with five observation stations and the short-arc method used for equalization are described briefly. Author (ESA)

N80-20645# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

ELABORATION OF THE TIME SYSTEM OF THE SATELLITE OBSERVATION STATION WETTZELL FROM 1972-1977 [DER AUFBAU DES ZEITSYSTEMS DER SATELLITENBEOBACHUNGSSTATION WETZELL IN DGN JAHREN 1972-1977)] c35

Klemens Nottarp and Ingo Zeitel *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 87-91 refs In GERMAN (For primary document see N80-20638 11-42)

Avail: NTIS HC A11/MF A01

The different techniques for time measurement used by the IFAG are described. Narrower time intervals used to be determined as the techniques of distance measurement developed. The progressive definition of the standard frequency and the improvements of timing devices are elaborated. Results obtained from collaborating stations are compared and discussed. A synchronization precision should reach five nanoseconds.

Author (ESA)

N80-20646# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

PARTICIPATION OF SATELLITE OBSERVATION STATION WETZELL IN INTERNATIONAL OBSERVATION PROGRAMS, 1975-1977 [ZUR BETEILIGUNG DER SATELLITENBEOBACHTUNGSSTATION WETZELL AN INTERNATIONALGEN

BEOBACHTUNGSPROGRAMMEN (1975-1977)] c14
Hermann Seeger and Peter Wilson *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 93-103 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

The participation of the Wetzell satellite observation station in international observation programs from 1975 to 1977 is reported. Observations of the GEOS satellites from Wettzell and other stations, C-band radar measurements, the European Doppler measurment campaign EDOC 1 and 2, and the European laser distance measurement campaign are briefly reviewed.
Author (ESA)

N80-20647# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
ELABORATING AN ASTRONOMICAL LONGITUDE SYSTEM [ARBEITEN AM ASTRONOMISCHEN LAENGENNETZ]
Gerhard Soltau *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 105-109 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

The problem of astronomical longitude determination is examined. Systematic local variations in the astronomical longitude system are due to the consistency of the initial point. Relative longitude systems combination of these relative systems, comparing traditional geodetic and satellite methods eliminates errors and leads to a longitude systems homogeneous over Western Europe.
Author (ESA)

N80-20648# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DETERMINATION OF AZIMUTH AND ASTRONOMICAL COORDINATES c43
Gerhard Soltau *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 111-115 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

The determination of astronomical coordinates and azimuth from Laplace stations is examined. Observations from stations examining the vertical variation are discussed. A precision of .5 min. of arc can be reached for each component. A greater density of points will contribute more to precision than will improvements in the measurement possibilities.
Author (ESA)

N80-20649# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DETERMINATION OF VARIATIONS OF TIME DEPENDENT COORDINATES THROUGH ASTRONOMICAL AND DOPPLER OBSERVATIONS [ZEITABHAENGIGE KOORDINATENAENDERUNGEN, BESTIMMT DURCH ASTRONOMISCHE BEOBACHTUNGEN UND DURCH DOPPLERBEOBACHTUNGEN] c46
Wolfgang Schlueter *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 117-120 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

Variations in time dependent astronomical positioning determined by circumzenithal and by Doppler measurements are described. These variations are either determined physically from polar movement and earth crust deformations, or related to systematic experimental errors on the star coordinates or derived from experimental error. An error analysis compared circumzenithal observations and Doppler observations. Among others, an advantage of Doppler observations lies in its higher precision, its independence from weather, and automatic measuring capability.
Author (ESA)

N80-20650# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
CONTRIBUTIONS TO THE DETERMINATION OF THE GEOID IN WEST GERMANY [ARBEITEN ZUR BESTIMMUNE DES GEOIDES IN DER BUNDESREPUBLIK DEUTSCHLAND] c43
Dieter Lelgemann *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 121-125 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

The astrogeodetical estimation of the geoid derived from the local components of vertical derivation is described, and the regional representation examined. The combination of this method with the gravimetrical determination of the geoid for an automatic calculation is briefly discussed.
Author (ESA)

N80-20651# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE TRIANGULATION NETWORK IN WEST GERMANY [UNTERSUCHUNGEN IM HAUPTDREIECKSNETZ DER BUNDESREPUBLIK DEUTSCHLAND] c43
Dieter Ehlert *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 127-130 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

The development of the West German triangulation system is described. The precision of the network, including improvements, is examined. Corrections to consider in the experimental techniques and mathematical approach are discussed.
Author (ESA)

N80-20652# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
EARTH TIDES [ARBEITEN ZUR ERDGEZEITENUNTERSUCHUNG] c46
Rudolf Brein *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 131-133 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

A method of determining Earth tides from gravimetric data is described. The influence of harmonic forces on the Earth's crust at various time periods, and alterations of the shape of the Earth directly predictable by solar and lunar influences are investigated briefly.
Author (ESA)

N80-20653# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
RESEARCH ON GRAVIMETRY AT IFAG [GRAVIMETRISCHE FORSCHUNGSARBEITEN AM INSTITUT FUER ANGEWANDTE GEODAESIE] c46
Heinrich Beetz and Bernd Richter *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 135-140 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

Research of the institute in gravimetry is presented. The construction of the West German gravity network is described. Gravimetric maps are discussed and the choice of sites for new stations is examined.
Author (ESA)

N80-20654# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
CARTOGRAPHY APPLICATIONS AND RESEARCH [DIE KARTOGRAPHIE IN PRAXIS UND FORSCHUNG] c43
Walter Satzinger *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 141-142 In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

The evolution of cartography in response to growing needs for more precise representation is briefly related. Progress in reprography and data processing have results in improved quality at lower cost. The increasing number of applications of cartography to photogrammetry are mentioned.
Author (ESA)

N80-20655# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DEVELOPMENT, STATUS, AND GOALS OF CARTOGRAPHIC AUTOMATION [ENTWICKLUNG, AUFGABENSTELLUNG UND ZIELE DER KARTOGRAPHISCHEN AUTOMTION] c43
Wilhelm L. Pfrommer *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 143-148 In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

Progress in cartography with the development of automation is related briefly. Equipment in use by the EDV includes an interactive digitizing system (ARISTOGRID CD400), a cartographic automation system (coragraph DC3), and a high precision drafting table (coragraph 1700).
Author (ESA)

N80-20656# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
AUTOMATIC ACQUISITION AND PROCESSING OF CARTOGRAPHIC DATA [AUTOMATIONSGESTVETZTE ERFASSUNG UND AUFBEREITUNG KARTOGRAPHISCHER DATEN] c43
Theodor Johannsen *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 149-156 In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

The acquisition and processing of cartographic data is examined. Cartographic data gathered through photogrammetry, statistics or other means are digitized for computation; coordinates of points, their nature and alphanumeric symbols are recorded. Automatic drawing from optical sensors or scanners is described along with error control and correction procedures. Examples are given of the relative precision obtained at different production rates. Author (ESA)

N80-20657# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
ON PRECISION IN THE GATHERING AND PRODUCTION OF CARTOGRAPHIC DATA [GENAUIGKEITSUNTERSUCHUNGEN BEI ERFASSUNG UND AUSGABE KARTOGRAPHISCHER DATEN] c43
Theodor Johannsen *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 157-159 In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

The accuracy of digitizers in analog to digital conversion is examined. Measurements show that the scale error introduced is inferior to the resolution power of the apparatus. Improved precision can be obtained by means of an optical interferometer. Errors introduced by manual operations are discussed. Satisfactory results are obtained in the case of same-scale work and also when translating to a smaller scale. Author (ESA)

N80-20658# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
COMPUTER BASED GENERALIZATION FOR THE ELABORATION AND EXTENSION OF TOPOGRAPHIC MAPS [RECHNERGESTUETZTE GENERALISIERUNG BEI DGR HERSTELLUNG UND FORTFUEHRUNG TOPOGRAPHISCHER KARTEN] c43
Fred Christ *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 161-165 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

Research and programming for a computer based system for automatic mapping is described. The concept of calculator-based map generalization is exposed. Interactive, semi-automatic, and automatic generalization systems are presented.
Author (ESA)

N80-20659# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
GRAPHIC PRODUCTION OF MAPS ON SCREENS OR PHOTOCOMPOSITION DEVICES [GRAPHISCHE AUSGABE VON KARTEN AUF BILDSCHIRM UND LICHTZEICHENMASCHINE] c43
Helmut Uhrig *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 167-169 In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

Two image retrieval systems are described and compared. A cartographic system is discussed which converts numeric map data into analog images either on a screen or on a precision charting machine. Choice of a system depends on the desired speed and precision. Author (ESA)

N80-20660# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE DATA BANK IN THE CARTOGRAPHIC AUTOMATION SYSTEM [DIE DATENBANK IM KARTOGRAPHISCHEN AUTOMATIONSSYSTEM] c43
Wigand Weber *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 171-173 In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

The storage of data points on a magnetic disk unit for use in the production of topographic maps is described. The data are available over telephone lines to multiple users and also accessible for editing and other types of computer manipulation. The advantages of this flexibility are discussed. Author (ESA)

N80-20661# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE TOPOGRAPHIC SYNOPTIC MAP 1:200,000 [DIE TOPOGRAPHISCHE UEBERSICHTSKARTE 1:200,000 (TUEK 200)] c43
Rolf Boehme *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 175-176 In GERMAN Original contains color illustrations (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

The page by page development of the 1:200,000 synoptic topographic map is briefly described. Samples of this highly informative document are reproduced. Author (ESA)

N80-20662# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE SYNOPTIC MAP 1:500,000 (WORLD, SERIES 1404) [DIE UEBERSICHTSKARTE 1:500,000 (WORLD, SERIE 1404)] c43
Rolf Boehme *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 177-178 In GERMAN Original contains color illustrations (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

The 1:200,000 synoptic map is briefly described. A sample produced by IFAG is presented as well as a sample produced by the French National Geographic Institute. Author (ESA)

N80-20663# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE INTERNATIONAL WORLD MAP 1:1,000,000 (IWK) [DIE INTERNATIONALE WELTKARTE 1:1,000,000 (IWK)] c43
Wolfgang Weber *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 179-182 In GERMAN Original contains color illustrations (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

The development of the 1:1000,000 world map requested by the United Nations is briefly described. Samples of the 1942 and 1977 editions of the same maps are presented.
Author (ESA)

N80-20664# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
PHOTOGRAMMETRY IN IFAG FROM 1952 TO 1977 [DIE PHOTOGRAMMETRIE IM IFAG 1952-1977] c43
Hans Belzner *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 187-192 In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

The development of photogrammetric studies in the IFAG is reviewed. Collaboration with other institutions, in particular, with the Organisation Europeene d Etudes Photogrammetriques Experimenteles (OEEPE) is examined. Work in orthophototechniques from aircraft and satellites is described. Contributions to development in the Middle East are mentioned. Author (ESA)

N80-20665# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
ON SPECTRAL SIGNATURES IN CENTRAL PERSPECTIVE REPRESENTATION [ZUR BERUECKSICHTIGUNG VON OBJEKTEIGENSCHAFTEN IN ZENTRALPERSPEKTIVEN ABBILDUNGEN] c43
Joern Sievers *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 193-197 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

Object signature in aerial photography is briefly studies. Nonuniformity in tone (over the picture) due to sunlight reflection

in vertical photographs is discussed, and the effect of different Sun angles is shown in several photographs. Author (ESA)

N80-20668# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
ORTHOPHOTO TECHNIQUES AND PHOTOMAPS [ORTHOPHOTOTECHNIK UND LUFTBILDKARTE] c43
Rudolf Olach *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 199-201 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

The orthophototechnique and the development of orthophotoplans and aerial photographic maps is examined. Precision in orthophotographic techniques, the applications of orthophotoplans and their structure are described. Author (ESA)

N80-20667# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
AERIAL AND SPACE-BORNE PHOTOGRAPHIC MAPS [LUFTBILD UND WELTRAUMBILDKARTEN] c43
Heinz Schmidt-Falkenberg *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 203-210 refs In GERMAN Original contains color illustrations (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

The production of topographic aerial photography and spaceborne photomaps is described. Aerial photomaps are produced from orthophotographs with additional cartographic information. Rapid execution of photomaps, and difficulties of scale reduction by classical or automatic means are mentioned as justification for aerial and spaceborne photographic mapping. Author (ESA)

N80-20668# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
OBTAINING SURFACE INFORMATION FOR TOPOGRAPHY AND TOWN AND COUNTRY PLANNING FROM REMOTE SENSING [DAS GEWINNEN VON FLAECHENNUTZUNGS INFORMATIONEN MITTELS FERNERKUNDUNGSVERFAHREN FUER AUFGABEN DGR TOPOGRAPHIE UND DER LANDESPLANUNG] c43
Klaus Niemz *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 211-217 In GERMAN Original contains color illustrations (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

Methods developed for future Earth reconnaissance flights are described and discussed. Four test regions with different characteristics were selected: test region 1 (North Germany) for oceanic and coastal studies; test region 2 (Lower Main/Taunus/Wetterau) for town and country planning applications; test region 3 (Upper Rhine/Black Forest) for vegetation and forestry applications; test region 4 (Baltic region) for geological applications. Results obtained with a Bendix-11-channel scanner are presented and compared with LANDSAT 2 data. Different crops and land uses are characterized by color separation utilizing the DIBIAS system and the maximum likelihood method. Author (ESA)

N80-20669# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DIGITAL HEIGHT MODEL WITH ITEK CORRELATOR [DIGITALES HOEHENMODELL MIT DEM ITEK KORRELATOR] c43
Gerhard Lindig *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 219-223 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

Emphasis is given to the utilization of this model in the restitution of orthophotos. The most important factors taken into consideration include: determination of heights as accurately as possible; obtaining the least possible drop in correlation; rapid extraction of correlation; avoidance or domination of Floats; avoidance or recognition of Swings; elimination of systematic adaptation of parameters to different local conditions; filling in correlation loss gaps. It is concluded that the ITEK correlator EC5 can greatly contribute to the obtaining of height information for the orthophoto and also for height line maps. Author (ESA)

N80-20670# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE FUTURE OF ANALYTICAL EVALUATION EQUIPMENT [ERWARTUNGEN AN ANALYTISCHE AUSWERTEGERAETE] c43
Karl Schuerer *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 225-227 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

Developments in image measurement techniques are covered with emphasis on comparators and analog evaluation techniques. Advantages and disadvantages found in both techniques are considered. The feasibility of an apparatus incorporating the advantages of both systems and computer technology is addressed. Applications in practical photogrammetry and in the field of research are included. Author (ESA)

N80-20671# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DIGITAL MAP BASES FROM PHOTOGRAMMETRIC MEASUREMENTS [DIGITALE KARTENGRUNDLAGEN AUS PHOTOGRAMMETRISCHEN MESSUNGEN] c43
Hermann G. Neubauer *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 229-231 In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

Progress in electronic data processing has led to the development of accurate automated equipment for the production of all types of maps, systems, in which out-of-date information is eliminated and new objects, of particular interest, are introduced. Various calculation procedures associated with the transfer of measured data to digital maps are indicated: adaptation to the map's coordinate system; division of stereogram areas into areas of similar usage; association of measurements from adjacent stereograms; incorporation of modifications from field comparisons; preparation of data for storage in data banks. The automatic generation of height lines from discrete points is discussed. The corresponding coloration of different cultures can also be handled in this way. Author (ESA)

N80-20672# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
TASKS AND POSSIBILITIES OF DIGITAL IMAGE DATA PROCESSING IN PHOTOGRAMMETRY [AUFGABEN UND MOEGLICHKEITEN DGR DIGITALEN BILDVERARBEITUNG IN DGR PHOTOGRAMMETRIE] c43
Bernd-Siegfried Schulz *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 233-235 In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

A technique to accelerate fabrication and improve the quality of topographic maps made from primary data is described. Applications include remote sensing from aircraft and satellites. The treatment of data from LANDSAT 1, 2, and 3 is discussed. Optical and geometrical effects are corrected and contrast enhanced. High sensitivity is achieved enabling various surface coverages to be identified and studied in detail (different types of region, forests, geographical, and geological features). Correlations between different parts of a single image and between different images are studied and exploited. Author (ESA)

N80-20673# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
AIRPORT OBSTACLE MAPS [FLUGPLATZ HINDERNISKARTEN] c43
Heinz Bannach *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1974 p 237-240 In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

The application of photogrammetry to the study of the effects of obstacles on a aircraft takeoff and landing is considered with emphasis on safety. Observation clearance limits required by the International Civil Aviation Organization are discussed along with regulations in force in Germany. A technique utilizing a high precision stereocomparator to determine the heights of various

man-made and natural objects is described. The way in which the measurements are made and interpreted is presented as a function of the real conditions prevailing. A practical example is given. Author (ESA)

N80-20674# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

REPORTS ON CARTOGRAPHY AND TOPOGRAPHICAL MEASUREMENTS. SERIES 1: ORIGINAL REPORT NO. 74 [NACHRICHTEN AUS DEM KARTEN- UND VERMESSUNGSWESEN. REIHE 1: ORIGINALBEITRAEGE HEFT NR. 74]

1978 78 p refs In GERMAN; ENGLISH summary
(Rept-74) Avail: NTIS HC A05/MF A01

Subjects dealt with in four separate papers are: (1) a computerized treatment of displacements on topographical maps of the Federal Republic of Germany (FRG) which frees the cartographer from certain routine tasks; (2) aerial photography of the FRG and West Berlin (flight details are given together with documentation on existing photographs); (3) the equipping of a special symbol disk with interchangeable symbols and its accuracy in cartographic work; and (4) data reduction as well as line generalization problems in cartography as optimization tasks. Five books treating communication problems, field and laboratory geomorphological studies, and other cartography problems are reviewed. For individual titles, see N80-20675 through N80-20678.

N80-20675# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

ON THE DISPLACEMENT PROBLEM AS PART OF A PROCESS IN GENERALIZING TOPOGRAHICAL MAPS. PROPOSITION FOR HIERARCHICAL ORDER AND THE SEARCH FOR EDP ASSISTED SOLUTIONS [ZUM PROBLEM DER VERDRAENGUNG ALS TEILVORGANG DER GENERALISIERUNG TOPOGRAPHYISCHER KARTEN. HIERARCHIEVORSCHLAG UND VERSUCH EINER EDV-GESTUETZTEN LOESUNG] c43

Roland Schittenhelm *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. No. 74 1978 p 5-19 refs In GERMAN; ENGLISH summary (For primary document see N80-20674 11-42)
Avail: NTIS HC A05/MF A01

Based on the results obtained from the investigation of practical cases of displacement on official maps of Germany, an order is proposed for map elements which could be observed during displacement. Solutions are given for three line element displacement cases (displacement by a compulsory point, displacement by a further element which is broadened or displaces itself, disentanglement of double hairpin bends of curved and broadened line elements). These have the advantage of freeing the cartographer from many routine tasks. Author (ESA)

N80-20676# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

TWENTY-FIVE YEARS OF AERIAL PHOTOGRAPHY BY THE INSTITUTE OF APPLIED GEODESY [JAHRE LUFTBILDNACHWEIS DES INSTITUTS FUER ANGEWANDTE GEODAESIE] c43

Heinz Schmidt-Falkenberg *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. No. 74 1978 p 21-38 refs In GERMAN; ENGLISH summary (For primary document see N80-20674 11-42)
Avail: NTIS HC A05/MF A01

After a short survey of aerial photography developments in Germany after the Second World War, some details are given about the aerial photography documentation which the institute possesses. Information is also given about the number and frequency of photo flights over a period of ten years. A detailed list of aerial photographs of the German estates is presented together with a list of aerial photography archives existing in Germany. Author (ESA)

N80-20677# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

A SYMBOL DISK WITH INTERCHANGEABLE SYMBOLS AND ITS APPLICATIONS TO CARTOGRAPHY [EINE SYMBOLSCHEIBE MIT AUSWECHSELBAREN SYMBOLEN UND IHRE EINSATZMOEGLICHKEIT IN DER KARTOGRAPHIE] c43

Helmut Uhrig *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. No. 74 1978 p 39-53 refs In GERMAN; ENGLISH summary (For primary document see N80-20674 11-42)
Avail: NTIS HC A05/MF A01

A simple disk system that is both accurate and easily modifiable was sought. The system developed possesses 72 symbols which can be positioned by the user employing the cut and peel process or a technical method of reproduction. Specially positioned studs and holes assure that the disk is correctly centered, that the masks are in the right position, and that the unwanted part of the disk is correctly covered. A water distribution map is taken as an example. The maximum positioning error on the map itself resulting from the use of this technique is 32 microns. Author (ESA)

N80-20678# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

LINE GENERALIZATION AND DATA REDUCTION FROM A MATHEMATICAL OPTIMIZATION POINT OF VIEW [LINIENGENERALISIERUNG UND DATENREDUKTION UNTER DEM GESICHTSWINKEL DER MATHEMATISCHEN OPTIMIERUNG] c61

Wigand Weber *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. No. 74 1978 p 55-66 refs In GERMAN; ENGLISH summary (For primary document see N80-20674 11-42)
Avail: NTIS HC A05/MF A01

Two solutions are described. In the first, a polygonal substitute for the original curve is sought, the control points of which lie within a tolerable lateral distance range from the original curve; the maximum value of this range is constant for data reduction and self adapting with respect to local information density behavior for generalization. In the second, a rigorous formula using the lateral distances between successive points on the original curve and a reference line is used. Author (ESA)

N80-20679# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

REPORTS ON CARTOGRAPHY AND TOPOGRAPHICAL MEASUREMENTS. SERIES 2: TRANSLATIONS

1978 127 p refs
(Rept-35) Avail: NTIS HC A07/MF A01

Eleven texts are presented concerning automated displacement of point and line features in cartographic generalization, a digital terrain model for large surfaces and direct storage access, photomapping tidal flat areas, testing the accuracy of cartographic equipment, color separation, locational characteristics and computer assisted cartographic generalization, computer assisted thematic mapping, digitizing geometric data for thematic mapping, and some programs for the transformation of the contents of available maps according to different map projections. For individual titles, see N80-20680 through N80-20690.

N80-20680# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

A PROGRAM FOR THE FULLY AUTOMATED DISPLACEMENT OF POINT AND LINE FEATURES IN CARTOGRAPHIC GENERALIZATION c43

Fred Christ *In its* Rept. on Cartography and Topographical Meas. Ser. 2: Transl. 1978 p 5-30 refs (For primary document see N80-20679 11-42)
Avail: NTIS HC A07/MF A01

A program for the fully automated displacement of point and line features in cartographic generalization is described. The basic algorithm is a correlation of the displacement effects of the features when deriving a small scale map from a large scale map. Raster based processing is used. K.L.

N80-20681# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

A DIGITAL TERRAIN MODEL FOR LARGE SURFACES AND DIRECT STORAGE ACCESS c43

Rainer Detering *In its* Rept. on Cartography and Topographical Meas. Ser. 2: Transl. 1978 p 31-34 refs (For primary document see N80-20679 11-42)

Avail: NTIS HC A07/MF A01

A digital terrain model based on an equidistant grid structure which uses nonlinear interpolation while storing numerical values of elevations and slopes is proposed. The model, characterized by its high storage capacity and universality, is based on bicubic spline functions. The mathematically exact solution of a common adjustment in the total domain of definition is limited in favor of a pointed interactive change of input data. Author (ESA)

N80-20682# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

THE PRODUCTION OF PHOTOMAPS FROM TIDAL FLAT AREAS c43

Guenter Hake *In its* Rept. on Cartography and Topographical Meas. Ser. 2: Transl. 1978 p 35-41 refs (For primary document see N80-20679 11-42)

Avail: NTIS HC A07/MF A01

Clearly visible water lines from a series of infrared aerial photographs taken at the time of rising tides in tidal flat areas are digitized and transformed into contours by the allocation of individual elevation values. The cartographic combination of the contour representation and rectified aerial photographs from the time of the lowest water level leads to a photomap with a very high information content. Changes in elevation and volume can be calculated from subsequent photographs. Author (ESA)

N80-20683# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

TESTING THE ACCURACY OF CARTOGRAPHIC EQUIPMENT: FIRST RESULTS c43

Theodor Johannsen *In its* Rept. on Cartography and Topographical Meas. Ser 2: Transl. 1978 p 43054 refs (For primary document see N80-20679 11-42)

Avail: NTIS HC A07/MF A01

Different methods of testing digitizers and plotters were developed and verified. Apart from simple tests (without the use of any additional equipment), profiles were measured with high precision using a laser interferometer. In addition, a technique was developed to establish the errors introduced by an operator when manually guiding the cursor for digitizing. It is concluded that absolute scale measurements and accurate local tests require equipment with resolution and accuracy exceeding those of the instrument to be measured by at least an order of magnitude. Author (ESA)

N80-20684# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

ADP-SUPPORTED COLOR SEPARATION c74

Hans Kern *In its* Rept. on Cartography and Topographical Meas. Ser. 2: Transl. 1978 p 55-64 (For primary document see N80-20679 11-42)

Avail: NTIS HC A07/MF A01

Automated color separation is treated as a special topic of thematic computer cartography. Its aim is to develop a procedure satisfying the highest demands for quality and precision while flexibly treating the question of whether a map should be drafted in color or in black and white. A scheme for integrating computer cartography into spatial analysis processes is discussed. Algorithms are presented which provide an ample variety of hatching for any type of area and prevent the overlapping of thematic symbols. Hatching identifications and color indices are introduced. Author (ESA)

N80-20685# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

LOCATIONAL CHARACTERISTICS AND THE SEQUENCE OF COMPUTER ASSISTED PROCESSES OF CARTOGRAPHIC GENERALIZATION c43

Werner Lichtner *In its* Rept. on Cartography and Topographical Meas. Ser. 2: Transl. 1978 p 65-75 refs (For primary document see N80-20679 11-42)

Avail: NTIS HC A07/MF A01

A sequence of generalization processes for computer assisted operation is proposed which is intented to avoid both repetition of processes and frequent correction during batch compilation with the aid of interactive optical display systems. Particular attention is given to effects producing a lack or an excess of space and to locational changes in features and phenomena. Specific examples involving buildings and roads are discussed, as are displacement processes and the smoothing of contours and other linear phenomena. Good results are obtained with this method which has the advantage of homogeneity over manual methods. Author (ESA)

N80-20686# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

COMPUTER-ASSISTED THEMATIC MAPPING FOR FEDERAL PLANNING c43

Wolf-Dieter Rase *In its* Rept. on Cartography and Topographical Meas. Ser. 2: Transl. 1978 p 77-83 refs (For primary document see N80-20679 11-42)

Avail: NTIS HC A07/MF A01

To satisfy the needs for thematic maps on different levels of quality and quantity, computer assisted techniques were implemented in the map production process. Choropleth, graduated symbol, and other map types are plotted on an in-house minicomputer system with graphic peripherals. Remarks on the economic efficiency of computer assisted thematic cartography supplement the technical information. Author (ESA)

N80-20687# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

DIGITIZING OF GEOMETRIC DATA FOR THEMATIC MAPPING: STATE-OF-THE-ART AND FUTURE DEVELOPMENTS c43

Klaus Tuerke *In its* Rept. on Cartography and Topographical Meas. Ser. 2: Transl. 1978 p 85-91 refs (For primary document see N80-20679 11-42)

Avail: NTIS HC A07/MF A01

The cartographic data structures suitable for thematic computer mapping are surveyed and the data formats and digitizing procedure used in a production oriented environment are described in detail. Presently, interactive digitizing by experienced cartographic personnel is the most economic way of generating a geometric data base; improved techniques of automatic data acquisition, however, will shift the cartographeer's function from mass data encoding to interactive correction, generalization, and administration of scanned data. Author (ESA)

N80-20688# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

EXPERIENCES GATHERED WITH A SYMBOL DISK WITH INTERCHANGEABLE SYMBOLS c81

Helmut Uhrig *In its* Rept. on Cartography and Topographical Meas. Ser. 2: Transl. 1978 p 93-106 refs (For primary document see N80-20679 11-42)

Avail: NTIS HC A07/MF A01

A simple disk system that is both accurate and easily modifiable was sought. The system developed possesses 72 symbols which can be positioned by the user employing the cut and peel process or a technical method of repoduction. Specially positioned studs and holes assure that the disk is correctly centered, that the masks are in the right position, and that the unwanted part of the disk is correctly covered. A water distribution map is taken as an example. The maximum positioning error on the map itself resulting from the use of this technique is 32 microns. Author (ESA)

N80-20689# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

DATA CAPTURE FOR CARTOGRAPHIC DATA BASES c80

Helmut Uhrig *In its* Rept. on Cartography and Topographical Meas. Ser. 2: Transl. 1978 p 102-113 (For primary document see N80-20679 11-42)

Avail: NTIS HC A07/MF A01

The establishing of cartographic data bases from a 1:1 million map of the German Federal Republic showing administrative boundaries and from a world map of the same scale is described. It is concluded that only two digitizing procedures are valid; these are digitizing according to an original map of large scale or to an enlarged manuscript and digitizing 1:1. Author (ESA)

N80-20690# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

MAP PROJECTION CHANGE: SOME PROGRAMS FOR THE TRANSFORMATION OF THE CONTENTS OF AVAILABLE MAPS ACCORDING TO DIFFERENT MAP PROJECTIONS c43

Ingo Wiski *In its* Rept. on Cartography and Topographical Meas. Ser. 2: Transl. 1978 p 115-127 refs (For primary document see N80-20679 11-42)

Avail: NTIS HC A07/MF A01

Some FORTRAN programs are presented for the transformation of digitized map contents into geographical coordinates (Mercator and Lambert projections) and for the mass transformation of spherical geographical coordinates into rectangular map coordinates. Thirteen different map projections are considered, the graphical output being presented as a visual display and/or by a machine drawing. Author (ESA)

N80-20691# Bayerische Akademie der Wissenschaften, Munich (West Germany).

RESEARCH PROGRAM 78, SATELLITE GEODESY PROGRAM [DIE ARBEITEN DES SONDERFORSCHUNGSBEREICHES 78 SATELLITENFEODAESIE IM JAHR 1977]

Manfred Schneider, comp. 1978 177 p refs In GERMAN; ENGLISH summary

(Astron-Geodaet-Arb-38; ISBN-3-76969-781-2; ISSN-0340-7691) Avail: NTIS HC A09/MF A01

The research program and operation of the Wetzell tracking station are discussed in terms of their contribution to the European space effort. Direction and distance measurements as well as Doppler observations are reviewed. Mathematical methods used in geodetic research are surveyed. For individual titles, see N80-20692 through N80-20704.

N80-20692# Bayerische Akademie der Wissenschaften, Munich (West Germany).

IMPROVED TABLES OF COORDINATES ALLOTTED TO THE WETZELL SATELLITE TRACKING STATION [VERBESSERTE UND ERGAENZTE KOORDINATENVERZEICHNISSE FUER DEN BEREICH DER SATELLITENBEOBACHTUNGSSTATION WETTZELL] c43

Eberhard Billich and Hermann Seeger *In its* Res. Program 78, Satellite Geodesy Program 1978 p 18-28 ref In GERMAN (For primary document see N80-20691 11-42)

Avail: NTIS HC A09/MF A01

A more accurate set of coordinates was determined for benchmarks within the satellite tracking station. These were identified on a map with the appropriate data for each benchmark presented in tabular form. Author (ESA)

N80-20693# Bayerische Akademie der Wissenschaften, Munich (West Germany).

SELECTION OF A RUBY LASER FOR USE AS AN ILLUMINATING LASER FOR THE BMK75 OR AS A REFLECTING LASER FOR SRS [KONZEP EINES RUBINLASER FUER WAHLWEISEN BETRIEB ALS BELEUCHTUNGSLASER FUER DIE BMK 75 ODER ENTFERMUNGSMESSLASER FUER DAS SRS] c36

Klemens Mottarp *In its* Res. Program 78, Satellite Geodesy Program 1978 p 31-35 refs In GERMAN (For primary document see N80-20691 11-42)

Avail: NTIS HC A09/MF A01

The upgrading of the laser system at the Wetzell satellite tracking station is discussed. The possibility of using the same ruby laser for both direction and reflectance measurements is examined. The pulse slicing mode is compared to the pulse transmission mode. Author (ESA)

N80-20694# Bayerische Akademie der Wissenschaften, Munich (West Germany).

ON THE VERIFICATION OF SATELLITE REFLECTANCE MEASUREMENTS [ZUR UEBERPRUFFUNG VON ENTFERNUNGSMESSUNGENNACH SATELLITEN] c15

Helmut Walter *In its* Res. Program 78, Satellite Geodesy Program 1978 p 38-44 refs In GERMAN (For primary document see N80-20691 11-42)

Avail: NTIS HC A09/MF A01

Error reduction techniques used by the Wetzell satellite tracking station for reflectance and Doppler measurements are discussed. Computer programs used to remove instrumental error and atmospheric refraction errors are outlined. Author (ESA)

N80-20695# Bayerische Akademie der Wissenschaften, Munich (West Germany).

EXTENDING THE NEODYMIUM-YAG LASER REFLECTANCE MEASURING SYSTEM TO LUNAR MEASUREMENTS AT THE WETZELL STATION [ZUR ERWEITERUNG DES NEODYMIUM-YAG LASERENTFERNUNGSMESSYSTEMS DER STATION WETTZELL FUER ENTFERNUNGSMESSUNGEN ZUM MOND] c36

Peter Wilson *In its* Res. Program 78, Satellite Geodesy Program 1978 p 45-49 refs In GERMAN (For primary document see N80-20691 11-42)

Avail: NTIS HC A09/MF A01

The upgrading of the laser system at the Wetzell station is discussed. Improvements include an increase in the energy output, the development of a greater pointing accuracy, and refinements in the hardware and software systems. Author (ESA)

N80-20696# Bayerische Akademie der Wissenschaften, Munich (West Germany).

THE GERMAN-AUSTRIAN DOPPLER OBSERVATION CAMPAIGN [UEBER DEN DERZEITIGEN STAND DER ARBEITEN IM DEUTCHEN ANTEIL DER DEUTSCH OESTERREICHISCHEN DOPPLERMESSKAMPAGNE] c35

Wolfgang Schlueter, Hermann Seeger, Gerhard Soltau, Peter Wilson, and Peter Wolf *In its* Res. Program 78, Satellite Geodesy Program 1978 p 54-64 refs In GERMAN (For primary document see N80-20691 11-42)

Avail: NTIS HC A09/MF A01

The contributions made by the 15 German and Austrian Doppler observation stations to the calculation of more precise transformation parameters for a national triangulation network are described. Verification of the scale and orientation of this network, and the extension of this verification to central Europe are considered. Calculation of the geocentral coordinates NWL-9D (NSWC-9z-2) and WGS-72 was facilitated by network measurements. Author (ESA)

N80-20697# Bayerische Akademie der Wissenschaften, Munich (West Germany).

THE EROS-DOPPLER OBSERVATION CAMPAIGN (EROS-DOC) [DIE EROS DOPPLER BEOBACHTUNGSKAMPAGNE (EROS-DOC)] c15

Wolfgang Schlueter, Hermann Seeger, Gerhard Soltau, Peter Wilson, and Peter Wolf *In its* Res. Program 78, Satellite Geodesy Program 1978 p 65-71 refs In GERMAN (For primary document see N80-20691 11-42)

Avail: NTIS HC A09/MF A01

Data from the Doppler observation program (EROS-1) conducted by eight satellite observation stations are presented. The calculations are discussed in reference to the broadcast ephemeris and the precise ephemeris. Author (ESA)

N80-20698# Bayerische Akademie der Wissenschaften, Munich (West Germany).

DEVELOPMENT OF DOPPLER OBSERVATIONS AT WETZELL DURING 1975-1976 [UEBER DIE AUSWERTUNG DER DOPPLERBEOBACHTUNGEN IN WETTZELL 1975-1976] c46

Wolfgang Schlueter *In its* Res. Program 78, Satellite Geodesy Program 1978 p 72-77 refs In GERMAN (For primary document see N80-20691 11-42)

Avail: NTIS HC A09/MF A01

Parallel astronomical and satellite observations of the Navy satellite system were made to clarify systematic differences between Doppler and astronomical methods of evaluating movement of the pole and the behavior of long term Doppler measurements. Data for 18 months of observations are presented. Author (ESA)

N80-20699# Bayerische Akademie der Wissenschaften, Munich (West Germany).

COMPARISON OF ALGORITHMS FOR THE SUMMATION OF SPHERICAL PLANE FUNCTIONS [VERGLEICH VON ALGORITHMEN ZUR SUMMATION VON KUGELFLAECHENFUNKTION] c64

Michael Gerstl *In its* Res. Program 78, Satellite Geodesy Program 1978 p 81-88 refs In GERMAN; ENGLISH summary (For primary document see N80-20691 11-42)
Avail: NTIS HC A09/MF A01

Parameters related to the Earth's gravity field as expressed by sums of spherical harmonics are discussed. Algorithms to evaluate the sums are investigated. The algorithms observe the stability minimal storage requirements and the number of operations. The results obtained for the speed of the algorithms are discussed. Author (ESA)

N80-20700# Bayerische Akademie der Wissenschaften, Munich (West Germany).
PROBLEMS OF APPROXIMATION BY MEANS OF SAMPLING FUNCTIONS [ZUR PROBLEMATIK DER APPROXIMATION MITTELS SAMPLING-FUNKTIONEN] c64
Heinz Fritz Schmidt *In its* Res. Program 78, Satellite Geodesy Program 1978 p 89-101 refs In GERMAN (For primary document see N80-20691 11-42)
Avail: NTIS HC A09/MF A01

An introduction to the theory of representation of the functions by means of a system of basic functions is presented. The possibility of approximation through sampling functions and point parameters is explained. Examples of practical interpolation in a one dimensional field are provided. A verification of an approximation with sampling functions is treated, showing the problem of sampling point distribution and sampling functions as a basis for the definition of the spherical functions.
Author (ESA)

N80-20701# Bayerische Akademie der Wissenschaften, Munich (West Germany).
ON THE USE OF LINES OF KERNEL FUNCTIONS FOR ORBITAL DETERMINATION [DIE NUTZUNG VON KERNFUNKTIONSREIHEN ZUR BAHNBESTIMMUNG] c13
Hermann Hauck *In its* Res. Program 78, Satellite Geodesy Program 1978 p 102-108 refs In GERMAN (For primary document see N80-20691 11-42)
Avail: NTIS HC A09/MF A01

The determination of orbits is dependent upon the solution of the Lagrangian equations for perturbation. Development of the proximity criterion of Legelmann allows a valid interpolation with the aid of kernel functions. A network of equidistant points is then set on the Earth's surface, each having a potential, the result of which is the resolution of the set problem.
Author (ESA)

N80-20702# Bayerische Akademie der Wissenschaften, Munich (West Germany).
THE RGST CHAIN PROGRAM FOR THE DETERMINATION OF POTENTIAL COEFFICIENTS AND STATION COORDINATES [DIE REST-PROGRAMMKETTE FUER DIE BESTIMMUNG VON POTENTIALKOEFFIZIENTEN UND STATIONSKOORDINATEN] c43
Christoph Reigber *In its* Res. Program 78, Satellite Geodesy Program 1978 p 111-119 refs In GERMAN (For primary document see N80-20691 11-42)
Avail: NTIS HC A09/MF A01

The dynamic method of satellite geodesy uses the numerical integration of the equations of motion to determine the temporal motion in relation to its reference orbit. A computer program REST is described which permits corrections to be performed for uncertainties introduced into the equations by the relief of the Earth and the elastic parameters of the Earth, Sun, and Moon. Author (ESA)

N80-20703# Bayerische Akademie der Wissenschaften, Munich (West Germany).
MOTION OF ARTIFICIAL EARTH SATELLITES IN RELATED ORBITS [ZUR BEWEGUNG KUENSTLICHER ERDSATGELLITEN IN BENACHBARTEN UMLAUFBAHNEN] c13
Karl Heinz Ilk and Wolfgang Seemueller *In its* Res. Program 78, Satellite Geodesy Program 1978 p 120-138 refs In GERMAN (For primary document see N80-20691 11-42)
Avail: NTIS HC A09/MF A01

The relative motion of a satellite and its booster in low Earth orbit is studied as a problem of movement of potential masses governed by the Newton-Euler equations. The derivation of the solution is presented. Author (ESA)

N80-20704# Bayerische Akademie der Wissenschaften, Munich (West Germany).
STUDY FOR A PROJECT FOR A EUROPEAN HIGH PRECISION LASER NETWORK [PROJEKTSTUDIE FUER SATELLITEN-LASERNETZ HOECHSTER GENAUIGKEIT IN EUROPA] c43
Walter Ehrnsperger and Martha Naebauer *In its* Res. Program 78, Satellite Geodesy Program 1978 p 139-158 refs In GERMAN; ENGLISH summary (For primary document see N80-20691 11-42)
Avail: NTIS HC A09/MF A01

Based upon simulated satellite transits of various heights, the attainable accuracy for a European network is investigated. The parameters are ranges as measured with third generation lasers or ranges in combination with optical directions. Numerical results for five stations and up to 100 satellite tracks are compared. Author (ESA)

N80-20705# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
REPORTS ON CARTOGRAPHY AND TOPOGRAPHICAL MEASUREMENTS. SERIES 1: ORIGINAL REPORTS [NACHRICHTEN AUS DEM KARTEN UND VERMESSUNGSWESEN. REIHE 1: ORIGINALBEITRAEGE HEFT NO. 77]
1978 179 p refs In GERMAN; ENGLISH summary Original contains color illustrations
(Rept-77; ISSN-0469-4236) Avail: NTIS HC A09/MF A01

Eight papers are presented dealing with photogrammetry, remote sensing, data enhancement using computer techniques (including least squares calulations), and application of Skylab and LANDSAT data to small scale cartography. Also treated are the production and analysis of multispectral images, definition of a reflective quantity for remote sensing data, and a calculation method for setting data for analog plotters. For individual titles, see N80-20706 through N80-20713.

N80-20706# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
CONTRIBUTIONS TO THE CREATION OF A CONCLUSIVE SYSTEM OF CONCEPTS OF PHOTOGRAMMETRY AND AERIAL PHOTOGRAPH CARTOGRAPHY [BEITRAG ZUM AUFBAU EINES GESCLOSSENEN BEGRIFSSYTEMS DER PHOTOGRAMMETRIES UND DER LUFTBILDKARTOGRAPHIES] c43
Heinz Schmidt-Falkenberg *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. 1978 p 7-35 refs In GERMAN; ENGLISH summary (For primary document see N80-20705 11-42)
Avail: NTIS HC A09/MF A01

In connection with the revision of the German standard DIN 18 716 (photogrammetry and remote sensing) a review is presented of the conceptual connections within the fields of image recording, image processing and image evaluation as well as aerial photograph cartography, which is to serve as a contribution to the creation of a theoretical basis for photogrammetry and aerial photograph cartography. Author (ESA)

N80-20707# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE PROBLEM OF OBTAINING DATA FOR THE DIGITAL HEIGHT MODEL [PROBLEME DER DATENGEWINNUNG FUER DAS DIGITALE HOEHENMODELL] c43
Gerhard Lindig *In its* Rept. on Cartography and Topographical meas. Ser. 1: Original Rept. 1978 p 37-48 refs In GERMAN; ENGLISH summary Presented at Intern. Symp. der IGP, Komm 3, Moscow, 1978 (For primary document see N80-20705 11-42)
Avail: NTIS HC A09/MF A01

The point coordinates for the Digital Height Model were measured with the necessary accuracy by photogrammetric methods. Problems were encountered in obtaining correct ground heights for wooded and built-up areas, for breaks of slope or for large fields with poor contrast by manual as well as by

automatic scanning. These problems were solved only by improving the original data using computer techniques. Author (ESA)

N80-20708# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

A METHOD FOR EXAMINING RELATIONSHIPS BETWEEN MULTISPECTRAL DATA [EINE METHODE ZUE PRUEFUNG CON ABHAENGIGKEITEN ZWISCHEN MULTISPEKTRALEN DATEN] c43

Bernd-Siefgried Schulz *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. 1978 p 49-69 refs In GERMAN; ENGLISH summary (For primary document see N80-20705 11-42)

Avail: NTIS HC A09/MF A01

A method to examine multispectral vectors of characteristics with regard to significant difference applied for instance, to problems of spectral object spearation, is presented. This method differs from former procedures by using (least squares) adjustment and visual evaluation of the corrections obtained as a result. The method saves computing time and can also be applied to large quantities of data. The method is tested through the use of several examples. Author (ESA)

N80-20709# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

SETTING DATA FROM MULTISTAGE ANALYTICAL ORIENTATION [EINSTELLDATEN AUS MEHRSTUFIGEN ANALYTISCHEN ORIENTIERUNGSVORGAENGEN] c43

Karl Schuerer *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. 1978 p 71-84 refs In GERMAN; ENGLISH summary (For primary document see N80-20705 11-42)

Avail: NTIS HC A09/MF A01

From the angles of rotation and the base components determined during the multistage analytical orientation, setting data for different analog plotting instruments are calculated. Preliminary experience shows that these data influences the economy of analog plotting considerably. Author (ESA)

N80-20710# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

POSSIBILITIES OF APPLICATION OF LANDSAT AND SKYLAB DATA TO SMALL SCALE CARTOGRAPHY [VERWENDUNGSMOEGLICHKEITEN VON LANDSAT UND SKYLABAUFNAHMEN IN DER KLEIMASSTAEBIGEN KARTOGRAPHIES] c43

Klaus Niemz *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. 1978 p 85-140 refs In GERMAN; ENGLISH summary (For primary document see N80-20705 11-42)

Avail: NTIS HC A09/MF A01

The possibility of producing small scale topographic maps from the 70 mm film taken from Skylab and multispectral scanner data from LANDSAT is discussed. Maps with scales from 1:100,000 to 1:2,800,000 are considered. The production equipment is described. Author (ESA)

N80-20711# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

ON THE WRITING ACCURACY OF THE REPRODUCTION UNIT OF THE OPTRONICS SYSTEM P1700 [ZUR SCHRIEBGENAUIGKEIT DER WEIDERGABEEINHEIT IM OPTRONICS SYSTEM P1700] c43

Bernd-Siegfried Schulz *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. 1978 p 141-148 In GERMAN; ENGLISH summary (For primary document see N80-20705 11-42)

Avail: NTIS HC A09/MF A01

A method for determining the accuracy of the plotting system of a digital image scanning device is described. A method is shown for eliminating linear affine distortions by introducing corrections into the writing mechanism. Author (ESA)

N80-20712# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

PRODUCTION OF COLOR COMPOSITES FORM MULTISPECTRAL DATA RECORDS [DIE HERSTELLUNG VON FARBKOMPOSITEN AUS MULTISPEKTRALAUFNAHMEN] c43

Hans Peter Groetsch *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. 1978 p 149-160 In GERMAN; ENGLISH summary (For primary document see N80-20705 11-42)

Avail: NTIS HC A09/MF A01

Production techniques and applications for color composites made from multispectral images are described. The use of Diazofoils results in higher accuracy than possible with film processes. Author (ESA)

N80-20713# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

REPORT OF THE IGP WORKING GROUP 7-9 'SPECTRAL SIGNATURES OF OBJECTS' [BERICHT DER IGP-ARBEITSGRUPPE 7-9 'SPEKTRALE SIGNATUREN VON OBJEKTEN']

Joern Sievers *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. 1978 p 161-166 In GERMAN; ENGLISH summary Presented at Symp. der Komm. 7 (Interpretation der daten) der Intern. Ges. fuer Photogrammetries, Freiburg/Br, West Germany, Jul. 1978 (For primary document see N80-20705 11-42)

Avail: NTIS HC A09/MF A01

A reflection quantity useful for remote sensing is established. In addition, the treatment of problems of accuracy in the determination of spectral object signatures is discussed in detail. Author (ESA)

N80-20714# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

INFORMATION RELATIVE TO CARTOGRAPHY AND GEODESY. SERIES 2: TRANSLATIONS

1978 44 p refs

(Rept-37; ISSN-0469-4244) Avail: NTIS HC A03/MF A01

Computation problems in using altimeter data for orbit determination are presented, along with a mathematical model for least squares estimation of geoidal undulations, sea surface topography, etc. For individual titles, see N80-20715 through N80-20716.

N80-20715*# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

ON ORBITAL FITTING WITH ALTIMETER DATA c43

D. Leigemann *In its* Inform. Relative to Cartography and Geodesy. Ser. 2: Transl. 1978 p 5-34 refs (For primary document see N80-20714 11-42)

(Contract NAS6-2481)

Avail: NTIS HC A03/MF A01

Using altimeter data from a single pass, orbital fiting of these data is investigated. The stability problems of this special kind of short are method as well as the problem in the case of a mean Keplerian ellipse are discussed in detail. It is shown that short periodic perturbations can influence the size of the eccentricity of the satellite orbit computed from these data. In this way the desired result, the corrections of d zeta to the geoidal undulations, may be falsified. Author (ESA)

N80-20716# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

ON A MATHEMATICAL MODEL FOR REMOTE SENSING ALTIMETRY c43

D. Leglemann *In its* Inform. Relative to Cartography and Geodesy. Ser. 2: Transl. p 35-42 refs Presented at 1st Gen. Assem. of European Assoc. Sensing Lab., Strasbourg, 23-24 Mar. 1977 (For primary document see N80-20714 11-42)

Avail: NTIS HC A03/MF A01

A parameter model for a least squares estimation of geoidal undulations, sea surface topography etc., which is considered as the basic tool for the use of altimetry as a remote sensing method, is outlined in its general geodetic aspects. Author (ESA)

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N80-20717* National Aeronautics and Space Administration, Washington, D. C.
EARTH RESOURCES. A CONTINUING BIBLIOGRAPHY WITH INDEXES, ISSUE 24
Jan. 1980 91 p
(NASA-SP-7041(24)) Avail: NTIS HC $10.50 CSCL 05B

This bibliography lists 345 reports, articles, and other documents introduced into the NASA scientific and technical information system between October 1, 1979 and December 31, 1979. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis. J.M.S.

N80-20718 Stanford Univ., Calif.
REMOTE SENSING OF OCEAN SURFACE CURRENT AND CURRENT SHEAR BY HF BACKSCATTER RADAR Ph.D. Thesis
Eng-Chong Ha 1979 153 p
Avail: Univ. Microfilms Order No. 8006317

Radio backscatter experiments to verify the feasibility of radio measurement of ocean current, and its vertical shear were conducted using radar operating at four frequencies covering the range from 3 to 30 MHz. Concurrent in-situ measurements were obtained by tracking spar buoys using a microwave ranging system. Both radar and buoy inferred currents agree generally in their variation with time and depth. Inversion of the Laplace transform relating the radar inferred Doppler velocity as a function of frequency to the vertical profile of the current is achieved numerically. Two estimators of Bragg line width based on the area of the spectral curve and the second moment about its centroid, respectively, are applied to over 100 hours of radar data. It is concluded that multifrequency backscatter ground-wave radar at HF constitutes a powerful technique for mapping current and its vertical profile in the top few meters of the ocean.
Dissert. Abstr.

N80-20719 Tennessee Univ., Knoxville.
APPLICATION OF LANDSAT IMAGERY TO MONITOR SAND DUNES MOVEMENT IN THE SAHARA DESERT Ph.D. Thesis
Ahmed Mokhtar Brera 1979 347 p
Avail: Univ. Microfilms Order No. 8005371

Band 5 and band 7 imagery available from LANDSAT 1 and LANDSAT 2 for the period between 1972 and 1976 over selected test areas in the Libyan Desert was used to identify and map distinct units on the ground. The results obtained were supported by ground truth data obtained from the selected sites in he form of topographic, geologic, and soil maps, aerial photographs, and meteorological information. The findings indicate that global surveillance of the status of dryland ecosystems and of land use can be achieved most economically through the use of LANDSAT imagery if proper image analysis techniques are used. Sand dune movement of the magnitude one kilometer and more can be detected easily using the proposed system.
Dissert. Abstr.

N80-20720 Case Western Reserve Univ., Cleveland, Ohio.
RESOURCE AND ENERGY CONSTRAINTS OF REGIONAL AND GLOBAL AVAILABILITY OF ALUMINUM COPPER, AND IRON 1975 - 2000: A COMPUTER STUDY Ph.D. Thesis
Aldo Francis Barsotti 1979 482 p
Avail: Univ. Microfilms Order No. 8005352

A computer submodel of a world integrated model system indicates that globally the resources and reserves of all three metals are more than adequate to meet projected metal needs, not only for the remainder of this century, but for at least through the year 2025 (assuming some accuracy of projections over that time horizon). The share of total energy needs accounted for by the metal (aluminum, copper and iron) industry varies considerably among countries. Based on economic settings in the model, and projections in growth of downline metal production capacity, the model indicates that forecasted energy production will be inadequate and have a major constraining effect on metal supply in most regions by the year 2000. The regions most affected by that shortage are Oceania, Japan, and Latin America. Because of its total lack of energy resources, Japan will be most vulnerable. Dissert. Abstr.

N80-20721*# Commonwealth Scientific and Industrial Research Organization, Ryde (Australia).
HEAT CAPACITY MAPPING MISSION (HCMM) Progress Report, 31 Aug. - 30 Nov. 1978
K. G. McCracken, Principal Investigator 30 Nov. 1979 2 p
Sponsored by NASA HCMM
(E80-10066; NASA-CR-162587) Avail: NTIS HC A02/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N80-20722*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
[EARTH SURVEY APPLICATIONS DIVISION: RESEARCH LEADING TO THE EFFECTIVE USE OF SPACE TECHNOLOGY IN APPLICATIONS RELATING TO THE EARTH'S SURFACE AND INTERIOR]
Nov. 1979 298 p refs ERTS
(E80-10084; NASA-TM-80550) Avail: NTIS HC A13/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N80-20723*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
[EARTH SURVEY APPLICATIONS DIVISION: RESEARCH* LEADING TO THE EFFECTIVE USE OF SPACE TECHNOLOGY IN APPLICATIONS RELATING TO THE EARTH'S *SURFACE AND INTERIOR] Annual Report, 1979
Lloyd Carpenter, ed. Jan. 1980 322 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E80-10087; NASA-TM-80642; AR-2) Avail: NTIS HC A14/MF A01 CSCL 05B

Accomplishments and future plans are described for the following areas: (1) geology - geobotanical indicators and geopotential data; (2) modeling magnetic fields; (3) modeling the structure, composition, and evolution of the Earth's crust; (4) global and regional motions of the Earth's crust and earthquake occurrence; (5) modeling geopotential from satellite tracking data; (6) modeling the Earth's gravity field; (7) global Earth dynamics; (8) sea surface topography, ocean dynamics; and geophysical interpretation; (9) land cover and land use; (10) physical and remote sensing attributes important in detecting, measuring, and monitoring agricultural crops; (11) prelaunch studies using LANDSAT D; (12) the multispectral linear array; (13) the aircraft linear array pushbroom radiometer; and (14) the spaceborne laser ranging system. For individual titles, see *N80-20724 through N80-20785*.

N80-20724*# National Aeronautics and Space Administration. *Goddard Space Flight Center, Greenbelt, Md.*
GEOBOTANICAL EXPLORATION
M. Labovitz, E. Masuoka, and A. Siegrist, Principal Investigators *In its Earth Survey Appl. Div.: Res. Leading to the Effective* Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 2-4 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 06C

There are no author-identified significant results in this report.

N80-20725*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

GEOLOGICAL/GEOPHYSICAL RESOURCE ASSESSMENT
R. C. Belcher, V. Gornitz, E. J. Masuoka, and K. T. Meehan, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 5-17 ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08F

There are no author-identified significant results in this report.

N80-20726*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETIC FIELD MODELING AND CRUSTAL STUDIES
P. T. Taylor and G. D. Mead, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 19-20 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08G

There are no author-identified significant results in this report.

N80-20727*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPHERICAL HARMONIC MODELS OF THE CORE FIELD
R. A. Langel, G. D. Mead, and R. H. Estes, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 21-29 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08G

There are no author-identified significant results in this report.

N80-20728*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CRUSTAL ANOMALY REPRESENTATION
R. A. Langel, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 30-38 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08G

There are no author-identified significant results in this report.

N80-20729*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANOMALY VERIFICATION: COMPARISON OF POGO MAGNETIC DATA WITH AEROMAGNETIC MEASUREMENTS
P. T. Taylor, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 39-52 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08G

There are no author-identified significant results in this report.

N80-20730*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
REGIONAL MODELING: THE KENTUCKY ANOMALY
M. A. Mayhew, H. H. Thomas, and P. J. Wasilewski, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to The Earth's Surface and Interior Jan. 1980 p 54-60 ref ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08F

There are no author-identified significant results in this report.

N80-20731*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
REGIONAL MODELING: THE IVREA ZONE
P. J. Wasilewski, M. A. Mayhew, and H. H. Thomas, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 61-62 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08F

There are no author-identified significant results in this report.

N80-20732*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERPRETATION OF GEOID ANOMALIES IN THE VICINITY OF SUBDUCTION ZONES
D. C. McAdoo, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 63-67 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08G

There are no author-identified significant results in this report.

N80-20733*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GLOBAL GEOLOGY AND GEOPHYSICS USING SATELLITE-DERIVED DATA
Herbert Frey, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 68-69 ref ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08G

There are no author-identified significant results in this report.

N80-20734*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GEOPHYSICAL ATLAS
P. D. Lowman, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 70-72 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08G

There are no author-identified significant results in this report.

N80-20735*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPARATIVE PLANETOLOGY/CRUSTAL EVOLUTION
Herbert Frey, Principal Investigator and P. D. Lowman, Jr. *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 73-74 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08G

There are no author-identified significant results in this report.

N80-20736*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CRUSTAL DEFORMATION: CRUSTAL DYNAMICS PROJECT
H. Frey, R. J. Allenby, and P. D. Lowman, Jr., Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 77-80 ref ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08G

There are no author-identified significant results in this report.

N80-20737*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INVESTIGATION OF CRUSTAL DYNAMICS USING VLBI
Chopo Ma and James W. Ryan, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 81-83 ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08G

There are no author-identified significant results in this report.

N80-20738*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CRUSTAL STRUCTURE AND DYNAMICS OF SOUTHEASTERN US
R. J. Allenby and M. A. Mayhew, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 84-85 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08G
There are no author-identified significant results in this report.

N80-20739*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PLATE BOUNDARY DEFORMATION IN CALIFORNIA
P. D. Lowenm, Jr., Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 86-95 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08G
There are no author-identified significant results in this report.

N80-20740*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE SELECTION OF STATION SITES FOR OBSERVING STRAIN STREPS AND EARTHQUAKE FORERUNNERS IN CALIFORNIA
H. S. Liu, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 96-97 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08K
There are no author-identified significant results in this report.

N80-20741*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GSFC SITE STABILITY
W. J. Webster, Jr. and R. J. Allenby, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 98 ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08K
There are no author-identified significant results in this report.

N80-20742*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GEODETIC STABILITY OF THE GREEN BANK, WEST VIRGINIA VLBI SITE
P. D. Lowman, W. J. Webster, Jr., and R. J. Allenby, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 99-102 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08G
There are no author-identified significant results in this report.

N80-20743*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EARTHQUAKE AND CRUSTAL DEFORMATION STUDIES
S. C. Cohen, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 103-108 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08K
There are no author-identified significant results in this report.

N80-20744*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GLOBAL INTRA-PLATE VOLCANISM
Han-Shou Liu, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 109-110 ref ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08G
There are no author-identified significant results in this report.

N80-20745*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DEVELOPMENT OF A SEISMIC DATA COLLECTION PLATFORM
W. J. Webster, Jr. and R. J. Allenby, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 111-113 ref ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08K
There are no author-identified significant results in this report.

N80-20746*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CRUSTAL MOTION MEASUREMENTS IN CALIFORNIA (SAFE)
D. E. Smith, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 114-115 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08K
There are no author-identified significant results in this report.

N80-20747*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GEODYN PROGRAM SYSTEMS DEVELOPMENT
B. H. Putney, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 118-120 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08E
There are no author-identified significant results in this report.

N80-20748*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GRAVITY MODEL DEVELOPMENT
F. J. Lerch, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 121-127 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08N
There are no author-identified significant results in this report.

N80-20749*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GRAVITY MODEL IMPROVEMENT FOR SEASAT
F. J. Lerch, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 128-132 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08G
There are no author-identified significant results in this report.

N80-20750*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE GRAVITY FIELD IN THE CENTRAL PACIFIC FROM SATELLITE-TO-SATELLITE TRACKING AND IMPLICATIONS FOR MANTLE CONVECTION
J. G. Marsh, Principal Investigator *In its* Earth Survey Appl.

Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 133-139 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08N

There are no author - identified significant results in this report.

N80-20751*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
UNEXPLAINED LAGEOS PERTURBATION
D. P. Rubincam, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 140-144 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08N

There are no author-identified significant results in this report.

N80-20752*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MANTLE CONVECTION AND SUBCRUSTAL STRESS
Han-Shou Liu, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 146-147 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08G

There are no author-identified significant results in this report.

N80-20753*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INFORMATION THEORY DENSITY DISTRIBUTION
D. P. Rubincam, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 148-156 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08G

There are no author-identified significant results in this report.

N80-20754*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE ENHANCED NODAL EQUILIBRIUM OCEAN TIDE AND POLAR MOTION
B. V. Sanchez, Prinicpal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 157-164 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08H

There are no author-identified significant results in this report.

N80-20755*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
POLAR MOTION RESEARCH
M. A. Graber, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 165-166 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08H

There are no author-identified significant results in this report.

N80-20756*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A DETERMINATION OF GM
David E. Smith, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 167-170 ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08G

There are no author-identified significant results in this report.

N80-20757*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
POLAR MOTION AND EARTH ROTATION RESULTS FROM LAGEOS
David E. Smith, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 171-173 ref ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08G

There are no author-identified significant results in this report.

N80-20758*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SEASAT ALTIMETER HEIGHT BIAS USING FOUR BERMUDA OVERFLIGHTS
R. Kolenkiewicz, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 176-186 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 14B

There are no author-identified significant results in this report.

N80-20759*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE EFFECT OF SEA STATE ON ALTIMETER MEASUREMENTS
R. Kolenkiewicz, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 187-189 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08C

There are no author-identified significant results in this report.

N80-20760*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MEAN SEA SURFACE COMPUTATION USING GEOS-3 ALTIMETER DATA
J. G. Marsh, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 190-197 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08C

There are no author-identified significant results in this report.

N80-20761*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OCEAN CIRCULATION
R. E. Cheney, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 198-202 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08C

There are no author-identified significant results in this report.

N80-20762*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STARLETTE ORBIT ANALYSES FOR OCEAN TIDAL STUDIES
T. L. Felsentreger and J. G. Marsh, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 203-206 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08C

There are no author-identified significant results in this report.

N80-20763*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
REMOTE MONITORING OF FOREST COVER CONDITIONS
D. Williams, S. Wharton, and R. Nelson, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 209-212 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 02F

There are no author-identified significant results in this report.

N80-20764*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SURFACE MINE MONITORING
J. R. Irons, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 213-215 ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08I

There are no author-identified significant results in this report.

N80-20765*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NASA-CENSUS APPLICATION PILOT TEST (APT) AND URBAN AREA DELINEATION STUDIES
D. Toll and S. Wharton, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 216-219 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 13B

There are no author-identified significant results in this report.

N80-20766*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IMPROVEMENT IN CLASSIFICATION ACCURACY OF LANDSAT MSS DATA IN AREAS OF MOUNTAINOUS TERRAIN
C. Justice, B. Holben, and S. Wharton, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 220-223 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N80-20767*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOURCES OF VARIATIONS IN LANDSAT AUTOCORRELATION
M. L. Labovitz, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 224-227 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N80-20768*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
REMOTE SENSING OF LEAF WATER CONTENT IN THE NEAR INFRARED
Compton J. Tucker, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 230-234 ref ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 06C

The author has identified the following significant results. Simulated spectral reflectances using different leaf water contents resulted in different reflectance changes in the 0.7 to 2.5 micron region of the spectrum. Consideration of the solar spectral irradiance and atmospheric transmission characteristics shows that the 1.55 to 1.75 micron spectral interval is the best suited band in the 0.7 to 2.5 micron region for monitoring plant canopy water status from space platforms. The 1.48 to 1.75 micron spectral interval is the best suited band for ground-based monitoring of plant canopy water status. The 1.50 to 1.63 micron region shows the greatest spectral radiance changes with a simulated leaf dehydration.

N80-20769*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PLANT STRESS AND RELATIONSHIPS TO SPECTRAL RESPONSES
J. B. Schutt, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 235-237 ref ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 06C

The author has identified the following significant results. Comparison of the near infrared reflectance curves of cotton plants grown in a chamber, greenhouse, and in the field show that field cotton has the lowest reflectance over the regions from 0.8 to 1.3 microns and 1.92 to 2.5 microns, with greenhouse and growth chamber spectra with higher reflectances in respective order. The reflectance levels from 1.42 to 1.92 microns (1.55 to 1.75 microns) were independent of lighting conditions. Spectral response curves recorded in the near-UV and near-IR regions for tomato leaves subjected to O3, SO2, and their combination, show that greater consistency in detectability was found in the new-UV. Results show that visible damage first appeared at the upper surface of a leaf, while incipient damage was first detected at the under surface.

N80-20770*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MONITORING DROUGHT IN COLORADO WITH LANDSAT MSS
C. J. Tucker and D. W. Deering, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 238-241 ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 08H

There are no author-identified significant results in this report.

N80-20771*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EFFECTS OF WHEAT IRRIGATION FREQUENCY ON REFLECTANCE IN SELECTED SPECTRAL BANDS
E. W. Chappelle, F. W. Wood, and W. W. Newcomb, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 242-246 ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N80-20772*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OFF-NADIR VIEWING EFFECTS ON SPECTRAL ASSESSMENT OF GREEN BIOMASS
D. W. Deering, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 247-251 ref ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 02C

The author has identified the following significant results. Off-nadir pointing of remote sensors decreased the red radiance and increased the infrared radiance in a situation of sparse ground cover and low levels of green biomass by increasing the proportion of the measured spectral response that was affected by interaction with the plant material component of the vegetation scene. The

magnitude of the spectral radiance value changes with changes in off-nadir viewing angle indicate that from 0 deg to 20 deg no significant radiometric adjustments are necessary, but at larger veiw angles, adjustment-to-nadir algorithms may be necessary for many applications. The infrared/red ratio vegetation index exhibited enhanced sensitivity to the green biomass in low biomass situations.

N80-20773*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THERMAL ANISOTROPY OF VEGETATION CANOPIES
D. S. Kimes, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 252-256 refs ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 02F

There are no author-identified significant results in this report.

N80-20774*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TIME OF DAY EFFECTS ON WHEAT REFLECTANCE IN FIFTEEN SELECTED BANDS
E. W. Chappelle, F. W. Wood, and W. W. Newcomb, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 257-259 ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N80-20775*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ASSESSING SOYBEAN LEAF AREA AND LEAF BIOMASS BY SPECTRAL MEASUREMENTS
B. N. Holben, C. J. Tucker, and C. Fan, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 260-263 ref ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 02C

The author has identified the following significant results. Red and photographic infrared spectral radiances were correlated with soybean total leaf area index, green leaf area index, chlorotic leaf area index, green leaf biomass, chlorotic leaf biomass, and total biomass. The most significant correlations were found to exist between the IR/red ratio data and green leaf index and/or green leaf biomass (r2 = 0.85 and 0.86 respectively).

N80-20776*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RELATIVE SENSITIVITY OF FIFTEEN SPECTRAL BANDS TO CHANGES IN SOYBEAN CANOPY COVER FOR WET AND DRY SOILS
E. W. Chappelle, R. Bell, F. W. Wood, D. W. Deering, and M. Labovitz, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 264-268 ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N80-20777*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RADIOMETRIC RESOLUTION FOR MONITORING VEGETATION: HOW MANY BITS ARE NEEDED?
C. J. Tucker, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 269-275 ref ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 02C

The author has idenfified the following significant results. The solar zenith angle has an effect on the noise equivalent change in reflectance. Two hundred fifty-six quantizing levels gave a 1% to 3% improvement per channel over 64 quantizing levels, and a 1% improvement per channel over 128 quantizing levels. No improvements were found for 256 vs 512 levels. Either 128 or 256 quantizing levels appear optimum for orbital monitoring of terrestrial vegetation for thematic mapper bands 3 and 4, or similar sensor bands. However, the data rate for 256 quantizing levels is 12.5% higher than the data rate for 128 levels, other parameters being equal. The thematic mapper was found to be closely matched to the scene dynamic radiance range for targets without incorporating variable gain control in the instrument.

N80-20778*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THEMATIC MAPPER VERSUS MULTISPECTRAL SCANNER FOR CROP MONITORING
B. L. Markham, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 276-280 ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N80-20779*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPECTRA OF ISOLATED VEGETATIONAL CONSTITUENTS
E. W. Chappelle and F. W. Wood, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 281-282 ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N80-20780*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A SPECTRAL METHOD FOR DETERMINING THE PERCENTAGE OF GREEN HERBAGE MATERIAL IN CLIPPED SAMPLES
C. J. Tucker, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 283-286 ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N80-20781*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EVALUATION OF A SPECTRAL METHOD FOR PERCENTAGE GREEN DETERMINATION USING CLIPPED RANGELAND FORAGE SAMPLES
D. W. Deering, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 287-290 ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N80-20782*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT-D ASSESSMENT SYSTEM
D. Williams, D. Deering, K. Meehan, and J. Tucker, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 292-296 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N80-20723 11-43)
Avail: NTIS HC A14/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N80-20783*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

MULTISPECTRAL LINEAR ARRAY SENSOR DEVELOPMENT

C. C. Schnetzler, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 297-298 refs ERTS (For primary document see N80-20723 11-43)

Avail: NTIS HC A14/MF A01 CSCL 14B

There are no author-identified significant results in this report.

N80-20784*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

LINEAR ARRAY PUSHBROOM RADIOMETER DATA ANALYSIS

J. Irons and S. Wharton, Principal Investigators *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 299-302 ERTS (For primary document see N80-20723 11-43)

Avail: NTIS HC A14/MF A01 CSCL 14B

There are no author-identified significant results in this report.

N80-20785*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE SPACEBORNE LASER RANGING SYSTEM

W. D. Kahn, Principal Investigator *In its* Earth Survey Appl. Div.: Res. Leading to the Effective Use of Space Technol. in Appl. Relating to the Earth's Surface and Interior Jan. 1980 p 303-308 refs ERTS (For primary document see N80-20723 11-43)

Avail: NTIS HC A14/MF A01 CSCL 20E

There are no author-identified significant results in this report.

N80-20786# Electrotechnical Lab., Ibaraki (Japan).

MICROWAVE REMOTE SENSING TECHNOLOGY FOR THE MARINE OIL POLLUTION SURVEILLANCE

Toshio Nanoto, Ichiro Yokoshima, Yoshihiko Kato, Takehiko Hidaka, Yutaka Kurioka, Minoru Yokota, Shinobu Hashimoto, Hiroshi Nakano, and Masahiko Yamaguchi Aug. 1979 166 p refs In JAPANESE; ENGLISH summary

(Rept-202) Avail: NTIS HC A08/MF A01

The existing state of oil pollution in the adjacent seas of the Japanese Archipelago, the techniques used in the oil detection and monitoring, and technical problems to be met in carrying out the patrol mission concerned with the enforcement of marine environment protection law are outlined. Functional requirements of a practical surveillance system useful for facilitating the activities to prevent the marine oil pollution are given. Basic mechanisms of interactions of microwaves at the air-sea water and air-oil-sea water interfaces are described. Reflection coefficients and emissivities of clean sea and polluted sea are exemplified under a number of different conditions of the temperature and salinity of sea water, observing frequency, and polarization of electromagnetic wave. The mechanisms of interaction between microwave signals and the atmospheric component gases and water droplets of various sizes are described, and examples of parameters useful for calculations of practical atmospheric attenuation and emission of microwaves are given. J.M.S.

N80-20787*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ASSESSMENT OF SATELLITE AND AIRCRAFT MULTISPECTRAL SCANNER DATA FOR STRIP-MINE MONITORING

Ernie W. Spisz and Joyce T. Dooley Washington Mar. 1980 39 p Original contains color illustrations

(NASA-TM-79268; E-187) Avail: NTIS HC A03/MF A01 CSCL 08I

The application of LANDSAT multispectral scanner data to describe the mining and reclamation changes of a hilltop surface coal mine in the rugged, mountainous area of eastern Kentucky is presented. Original single band satellite imagery, computer enhanced single band imagery, and computer classified imagery are presented for four different data sets in order to demonstrate the land cover changes that can be detected. Data obtained with an 11 band multispectral scanner on board a C-47 aircraft at an altitude of 3000 meters are also presented. Comparing the satellite data with color, infrared aerial photography, and ground survey data shows that significant changes in the disrupted area can be detected from LANDSAT band 5 satellite imagery for mines with more than 100 acres of disturbed area. However, band-ratio (bands 5/6) imagery provides greater contrast than single band imagery and can provide a qualitative level 1 classification of the land cover that may be useful for monitoring either the disturbed mining area or the revegetation progress. However, if a quantitative, accurate classification of the barren or revegetated classes is required, it is necessary to perform a detailed, four band computer classification of the data. J.M.S.

N80-20788# RAND Corp., Santa Monica, Calif.

DISTANCE ESTIMATION FROM COGNITIVE MAPS Interim Report, Nov. 1977 - Feb. 1979

Perry W. Thorndyke Nov. 1979 50 p refs

(Contract N00014-78-C-0042; NR Proj. 157-410)

(AD-A080098; RAND/R-2474-ONR) Avail: NTIS HC A03/MF A01 CSCL 08/2

Four experiments investigated map clutter as a source of distortion in distance estimates. In experiments 1 and 2, subjects estimated distances between pairs of points on a memorized map. In experiment 1, subjects learned relative distances among cities incidentally; in experiment 2, they learned them intentionally. In both experiments, estimates increased as a linear function of the number of intervening points along the path. In experiment 3, subjects estimated distances while viewing the map. The clutter effect was reduced but not eliminated. In experiment 4, the clutter effect was demonstrated using subjects' pre-experimental knowledge of U.S. geography. GRA

N80-20789# SRI International Corp., Menlo Park, Calif.

INTERACTIVE AIDS FOR CARTOGRAPHY AND PHOTO INTERPRETATION Final Technical Report, 12 May 1976 - 9 Oct. 1979

Martin A. Fischler, G. J. Agin, H. G. Barrow, R. C. Bolles, and L. Quam Dec. 1979 129 p refs

(Contract DAAG29-76-C-0057; ARPA Order 2894)

(AD-A079553) Avail: NTIS HC A07/MF A01 CSCL 08/2

Research at SRI International under the ARPA Image Understanding Program was initiated to investigate ways in which diverse sources of knowledge might be brought to bear on the problem of analyzing and interpreting aerial images. The initial phase of research was exploratory and identified various means for exploiting knowledge in processing aerial photographs for such military applications as cartography, intelligence, weapon guidance, and targeting. A key concept is the use of a generalized digital map to guide the process of image analysis. The results of this earlier work were integrated in an interactive computer system called 'Hawkeye'. This system provides not only basic facilities necessary for a wide range of tasks in cartography and photo interpretation, but also a framework within which other applications can be readily demonstrated. GRA

N80-20790# Naval Ocean Research and Development Activity, Bay St. Louis, Miss. Remote Sensing Branch.

INTERACTIVE DIGITAL SATELLITE IMAGE PROCESSING SYSTEM FOR OCEANOGRAPHIC APPLICATIONS Final Report

Albert E. Pressman and Ronald J. Holyer Apr. 1978 18 p

(AD-A079697; NORDA-TN-23) Avail: NTIS HC A02/MF A01 CSCL 08/10

The NORDA oceanographic satellite remote sensing program will emphasize data exploitation as opposed to data collection. This emphasis is because the collection technology has already far outstripped our ability to utilize the data for oceanographic purposes. The satellite data system described herein is an essential component for development and demonstration of processing, analysis, and interpretation methodology. The NORDA system includes a near real-time capability to receive GOES and limited VHRR data for screening purposes. GRA

N80-20791# California Univ., Livermore. Lawrence Livermore Lab.

REMOTE SYSTEM SOFTWARE

Terry H. Gong 17 May 1979 29 p refs

(Contract W-7405-eng-48)
(UCID-18191) Avail: NTIS HC A03/MF A01

Remote system software for a digital seismic system is described. The system consists of four remote stations in California, Nevada, and Utah that transmit seismic data to a central computer. DOE

N80-20792# Nevada Bureau of Mines and Geology, Reno.
ASSESSMENT OF LOW- TO MODERATE-TEMPERATURE GEOTHERMAL RESOURCES OF NEVADA Final Report, Apr. 1978 - Jun. 1979
D. T. Trexler, Thomas Flynn, and Brian A. Koenig 1979 36 p refs
(Contract ET-78-S-08-1556)
(NVO-01556-1) Avail: NTIS HC A03/MF A01

A geothermal resource map of Nevada was produced that provides detailed information on low- to moderate-temperature geothermal systems, and that also evaluates their potential for direct non-electric utilization. The information shown on the map can be divided into two categories: spot data and regional assessment (or potential evaluation). Specific geochemical information, such as temperature, pH, and chemical species, is represented by approximately 300 circle and diamond-shaped symbols. Thirty-seven larger regions were evaluated for their potential for direct-use on the basis of a numerical technique, which is fully described. An additional 15 sites were designated as areas that may provide a basis for investigations, but that lack sufficient data for a detailed potential evaluation at this time. DOE

N80-20793# Gesellschaft fuer Mathematik und Datenverarbeitung, Bonn (West Germany). Inst. fuer Grafische Datenverarbeitung und Strukturerkennung.
EXPERIMENTS IN DIGITIZING LINE STRUCTURES BY A RASTER SCAN PROCESS [ERFAHRUNGEN MIT DER DIGITALISIERUNG VON RASTERMAESSIG ERFASSTEN LINIENSTRUKTUREN, TEIL 2]
Karl-Heinz Klein, Thomas Kreifelts, Karl Pick, and Gerd Woetzel 1978 54 p refs In GERMAN
(GMD-Mitt-37) Avail: NTIS HC A04/MF A01

An interactive computer system was designed for producing contour maps from stored digital data. A FORTRAN program, ISOLIN, is described. The program was written for a Siemens 4004/151 computer to drive a line plotter and a film output device. The system permits the rapid and economic drawing of maps in a production environment. Author (ESA)

N80-20794# Gesellschaft fuer Mathematik und Datenverarbeitung, Bonn (West Germany). Inst. fuer Grafische Datenverarbeitung und Strukturerkennung.
DETERMINATION OF LINES AND NODES FROM IMAGES
Gerd Woetzel 1978 68 p refs In GERMAN
(GMD-Mitt-44) Avail: NTIS HC A04/MF A01

A method for reducing the cost of digitizing existing base maps through the use of automated cartographic techniques is described. The lines and nodes of the cartographic systems are transformed into contours on a display through the generation of a skeleton from binary images. Algorithms are described which are used to combine information from different maps onto one improved map. Author (ESA)

N80-20795# National Technical Information Service, Springfield, Va.
WATER RESOURCES IN ARID AND SEMIARID REGIONS. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Sep. 1979
Robena J. Brown Dec. 1979 249 p Supersedes NTIS/PS-78/1066; NTIS/PS-77/0947; NTIS/PS-76/0838; NTIS/PS-75/737
(PB80-802259; NTIS/PS-78/1066; NTIS/PS-77/0947; NTIS/PS-76/0838; NTIS/PS-75/737) Avail: NTIS HC $30.00/MF $30.00 CSCL 13B

The citations cover reports concerned with water quality, resource management, potable water consumption, and irrigation as they apply to arid and semiarid regions, particularly those in the western regions of the United States. Hydrology, modeling, and water allocation are also covered along with studies on water conservation measures, which will add to the water resources in these areas. This updated bibliography contains 243 abstracts, 52 of which are new entries to the previous edition. GRA

N80-20796# Economics, Statistics and Cooperatives Service, Washington, D. C.
MAJOR USES OF LAND IN THE UNITED STATES, 1974
H. Thomas Frey Nov. 1979 39 p refs
(PB80-114226; AER-440) Avail: NTIS HC A03/MF A01 CSCL 02B

The United States has a land area of 2,264 million acres. The major use of this acreage in 1974 was: cropland, 465 million acres; forest land, 718 million acres; urban, recreational, and other special uses, 182 million acres; and miscellaneous land, 302 million acres. From 1969 to 1974 cropland, pasture and range, and forest land each decreased about 1 percent while special uses increased 6 percent. GRA

N80-20797# Environmental Monitoring and Support Lab., Las Vegas, Nev.
AIRBORNE LASER FLUOROSENSING OF SURFACE WATER CHLOROPHYLL a Interim Report, Jan. 1976 - Aug. 1978
M. Bristow, F. Nielsen, R. Furtek, and J. Baker Aug. 1979 79 p refs Prepared in cooperation with Nev. Univ., Las Vegas
(PB80-113400; EPA-600/4-79-048) Avail: NTIS HC A05/MF A01 CSCL 14B

A prototype airborne laser fluorosensor for monitoring surface water chlorophyll 'a' was tested over Lake Mead, Nevada. Trends in the remotely sensed data are in close correspondence with ground truth data. It is suggested that system performance can be improved by concurrently gauging the water optical attenuation coefficient and by implementing chlorophyll 'a' analyses on ground truth samples. GRA

N80-20798# Bureau of Mines, Pittsburgh, Pa. Pittsburgh Mining and Safety Research Center.
PLASTIC CANOPY: A COMPUTER PROGRAM FOR THE STRUCTURAL ANALYSIS OF PROTECTIVE CANOPIES
Kenneth D. Winters, Gary R. Govan, and James C. Ault 1979 205 p refs Prepared in cooperation with Woodward Associates, Inc., San Diego, Calif.
(PB80-122724; BM-IC-8795) Avail: NTIS HC A10/MF A01 CSCL 08I

FORTRAN 4 computer program for the structural analysis of protective canopies used in underground mines to protect equipment operators from roof falls and rollover protective structures used in surface mines to protect equipment during vehicle overturn accidents, is described. The program, entitled PLASTIC CANOPY, permits rapid and inexpensive calculation of the ultimate strength and deformation characteristics of a canopy for a variety of static loading conditions. Other features of the program include prediction of buckling of a beam member under combined axial compression loading and bending, plotting of the input geometry of the structure, and plotting of the deformed shape of the loaded structure. Program description, input instructions, program listing, and four example problems are included. GRA

N80-20799# Bureau of Mines, Washington, D. C. Div. of Nonmetallic Minerals.
LITHIUM MINERAL COMMODITY PROFILES
Richard H. Singleton Sep. 1979 31 p refs
(PB80-123011) Avail: NTIS HC A03/MF A01 CSCL 08I

The United States consumes over one-half of the world's lithium and provides about 70 percent of the market economy world's supply of lithium. Data are presented on domestic and worldwide lithium production, consumption, and reserves to monitor and analyze supply-demand relationships. Data on lithium including industry structure, uses, resources, technology, byproducts and coproducts, strategic considerations, economic factors and problems, operating factors and problems, and outlook to 2000. GRA

N80-20800# General Accounting Office, Washington, D. C. Energy and Minerals Div.
ANALYSIS OF CURRENT TRENDS IN U.S. PETROLEUM AND NATURAL GAS PRODUCTION
7 Dec. 1979 11 p

(PB80-116056; EMD-80-24) Avail: NTIS HC A02/MF A01 CSCL 08I

Petroleum and natural gas production in the U.S. is forecasted through the 1990's. It is concluded that production will decline in the 1980's, but could be stabilized in the 1990's provided new enhanced oil recovery techniques are utilized. Developments in frontier areas are also addressed. GRA

N80-20801# Texas Univ. at San Antonio. Div. of Environmental Studies.

ANALYSIS OF WATER RESOURCES REQUIREMENT FOR THE ENHANCED (TERTIARY) OIL RECOVERY IN THE SOUTHERN PLAINS REGION OF THE UNITED STATES

Chia Shun Shih and Susan H. Hamilton Sep. 1979 222 p refs

(Contract DI-14-34-0001-8120)

(PB80-110869; WB0-01005; OWRT-B-218-TEX(1)) Avail: NTIS HC A10/MF A01 CSCL 08I

Water resources requirements are analyzed in terms of both water quantity and quality, for the anticipated enhanced oil recovery operations to be implemented in the Southern Plains region of the United States. The enhanced oil recovery potential of each oil-producing reservoir in the four states of Texas, Oklahoma, New Mexico, and Louisiana is assessed using parameters describing the basic characteristics of crude oil and the reservoir formation. The water quality impacts of enhanced recovery method are assessed considering surface water pollution by discharged chemicals and waste waters, groundwater pollution by the fracture of well casings, and infiltration of chemical and oil/water mixtures. GRA

N80-20802# Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.

PUBLIC INFORMATION AND LAKE EUTROPHICATION: A CASE STUDY OF GULL LAKE IN SOUTHWESTERN MICHIGAN Completion Report, Jul. 1971 - Jun. 1974

George H. Lauff, Brian Moss, and David F. Tague Nov. 1979 74 p refs

(Contracts DI-14-21-0001-3589; DI-14-31-0001-4094)

(PB80-113715; WB0-01255; OWRT-B-021-Mich(2)) Avail: NTIS HC A04/MF A01 CSCL 08H

The principal cause of the decline of Gull Lake's water quality is shown to be phosphorus enrichment from septic systems and over-fertilized lawns. Efforts directed toward obtaining a reduction in phosphorus input through a community education and action program are described, including a monitoring program to provide extensive baseline data and dissemination of evidence documenting Gull Lake's degradation; factors which have improved water quality algal increases and changes, and the rate and extent of hypolimnetic oxygen depletion. It is recommended that sewage be diverted from Gull Lake and the use of lawn fertilizers containing phosphorus be eliminated on property adjacent to the lake. GRA

N80-20803# Lockheed Electronics Co., Inc., Las Vegas, Nev. Remote Sensing Lab.

COMPUTER PROCESSING OF MULTISPECTRAL SCANNER DATA OVER COAL STRIP MINES Final Report, 1 Jan. - 30 Jun. 1978

Charles E. Tanner Mar. 1979 62 p refs

(Contract EPA-68-03-2636)

(PB80-111677; EPA-600/7-79-080) Avail: NTIS HC A04/MF A01 CSCL 08I

Aircraft multispectral scanner data acquired over six coal strip mines in the states of Wyoming, Montana, Colorado, and Arizona were processed on the Data Analysis System (DAS) using a clustering approach to automatic pattern recognition. The classification results demonstrated that a level one hierarchy of vegetation features, manmade features, and disturbed areas could be easily obtained with a minimum amount of time. GRA

N80-20804# Centec Consultants, Inc., Reston, Va.

FUNCTIONAL ANALYSIS OF THE WATER RESOURCES SCIENTIFIC INFORMATION CENTER (WRSIC)

6 Sep. 1979 52 p

(Contract DI-14-34-0001-9601)

(PB80-111842; WB0-01201; OWRT-9601(1)) Avail: NTIS HC A04/MF A01 CSCL 08H

In particular, the analysis focused on the relationship of WRSIC to technology transfer and other activities of the Office of Water Research and Technology. Information presented is the result of a modern systems approach that structurally defines the WRSIC mission in terms of detailed functions. Two of the major tools used and their application to the WRSIC mission are described. A graphic overview of the WRSIC information system is included. Recommendations for improving the ability of WRSIC to satisfy present and near future requirements are discussed. GRA

N80-20805# American Society of Civil Engineers, New York. Urban Water Resources Research Council.

INTERNATIONAL SYMPOSIUM ON URBAN HYDROLOGY: PROCEEDINGS OF TWO SPECIAL SESSIONS, SPRING ANNUAL MEETING, AMERICAN GEOPHYSICAL UNION

M. B. McPherson, ed. Sep. 1979 130 p refs Conf. held in Washington, D.C., 28 May 1979

(Grant NSF ENV-77-15668)

(PB80-123078; TM-38; NSF/RA-790249) Avail: NTIS HC A07/MF A01 CSCL 08H

Advances made in the field of urban hydrology are discussed including a greatly increased use of urban runoff mathematical models. Urban hydrology and conventional hydrology are discussed and background information on the development of International Hydrology Program is presented, including identification of research objectives. GRA

N80-20648# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

DETERMINATION OF AZIMUTH AND ASTRONOMICAL COORDINATES

Gerhard Soltau *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 111-115 refs In GERMAN (For primary document see N80-20638 11-42)

Avail: NTIS HC A11/MF A01

N80-20650# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

CONTRIBUTIONS TO THE DETERMINATION OF THE GEOID IN WEST GERMANY [ARBEITEN ZUR BESTIMMUNE DES GEOIDES IN DER BUNDESREPUBLIK DEUTSCHLAND]

Dieter Lelgemann *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 121-125 refs In GERMAN (For primary document see N80-20638 11-42)

Avail: NTIS HC A11/MF A01

N80-20651# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

THE TRIANGULATION NETWORK IN WEST GERMANY [UNTERSUCHUNGEN IM HAUPTDREIECKSNETZ DER BUNDESREPUBLIK DEUTSCHLAND]

Dieter Ehlert *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 127-130 refs In GERMAN (For primary document see N80-20638 11-42)

Avail: NTIS HC A11/MF A01

N80-20654# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

CARTOGRAPHY APPLICATIONS AND RESEARCH [DIE KARTOGRAPHIE IN PRAXIS UND FORSCHUNG]

Walter Satzinger *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 141-142 In GERMAN (For primary document see N80-20638 11-42)

Avail: NTIS HC A11/MF A01

N80-20655# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

DEVELOPMENT, STATUS, AND GOALS OF CARTOGRAPHIC AUTOMATION [ENTWICKLUNG, AUFGABENSTELLUNG UND ZIELE DER KARTOGRAPHISCHEN AUTOMTION]

Wilhelm L. Pfrommer *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 143-148 In GERMAN (For primary document see N80-20638 11-42)

Avail: NTIS HC A11/MF A01

N80-20656# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

AUTOMATIC ACQUISITION AND PROCESSING OF CARTOGRAPHIC DATA [AUTOMATIONSGESTVETZTE ERFASSUNG UND AUFBEREITUNG KARTOGRAPHISCHER DATEN]
Theodor Johannsen *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 149-156 In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20657# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
ON PRECISION IN THE GATHERING AND PRODUCTION OF CARTOGRAPHIC DATA [GENAUIGKEITSUNTERSUCHUNGEN BEI ERFASSUNG UND AUSGABE KARTOGRAPHISCHER DATEN]
Theodor Johannsen *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 157-159 In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20658# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
COMPUTER BASED GENERALIZATION FOR THE ELABORATION AND EXTENSION OF TOPOGRAPHIC MAPS [RECHNERGESTUEZTE GENERALISIERUNG BEI DGR HERSTELLUNG UND FORTFUEHRUNG TOPOGRAPHISCHER KARTEN]
Fred Christ *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 161-165 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20659# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
GRAPHIC PRODUCTION OF MAPS ON SCREENS OR PHOTOCOMPOSITION DEVICES [GRAPHISCHE AUSGABE VON KARTEN AUF BILDSCHIRM UND LICHTZEICHENMASCHINE]
Helmut Uhrig *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 167-169 In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20660# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE DATA BANK IN THE CARTOGRAPHIC AUTOMATION SYSTEM [DIE DATENBANK IM KARTOGRAPHISCHEN AUTOMATIONSSYSTEM]
Wigand Weber *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 171-173 In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20661# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE TOPOGRAPHIC SYNOPTIC MAP 1:200,000 [DIE TOPOGRAPHISCHE UEBERSICHTSKARTE 1:200,000 (TUEK 200)]
Rolf Boehme *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 175-176 In GERMAN Original contains color illustrations (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20662# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE SYNOPTIC MAP 1:500,000 (WORLD, SERIES 1404) [DIE UEBERSICHTSKARTE 1:500,000 (WORLD, SERIE 1404)]
Rolf Boehme *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 177-178 In GERMAN Original contains color illustrations (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20663# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE INTERNATIONAL WORLD MAP 1:1,000,000 (IWK) [DIE INTERNATIONALE WELTKARTE 1:1,000,000 (IWK)]
Wolfgang Weber *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 179-182 In GERMAN Original contains color illustrations (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20664# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
PHOTOGRAMMETRY IN IFAG FROM 1952 TO 1977 [DIE PHOTOGRAMMETRIE IM IFAG 1952-1977]
Hans Belzner *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 187-192 In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20665# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
ON SPECTRAL SIGNATURES IN CENTRAL PERSPECTIVE REPRESENTATION [ZUR BERUECKSICHTIGUNG VON OBJEKTEIGENSCHAFTEN IN ZENTRALPERSPEKTIVEN ABBILDUNGEN]
Joern Sievers *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 193-197 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20666# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
ORTHOPHOTO TECHNIQUES AND PHOTOMAPS [ORTHOPHOTOTECHNIK UND LUFTBILDKARTE]
Rudolf Otach *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 199-201 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20667# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
AERIAL AND SPACE-BORNE PHOTOGRAPHIC MAPS [LUFTBILD UND WELTRAUMBILDKARTEN]
Heinz Schmidt-Falkenberg *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 203-210 refs In GERMAN Original contains color illustrations (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20668# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
OBTAINING SURFACE INFORMATION FOR TOPOGRAPHY AND TOWN AND COUNTRY PLANNING FROM REMOTE SENSING [DAS GEWINNEN VON FLAECHENNUTZUNGS INFORMATIONEN MITTELS FERNERKUNDUNGSVERFAHREN FUER AUFGABEN DGR TOPOGRAPHIE UND DER LANDESPLANUNG]
Klaus Niemz *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 211-217 In GERMAN Original contains color illustrations (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20669# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DIGITAL HEIGHT MODEL WITH ITEK CORRELATOR [DIGITALES HOEHENMODELL MIT DEM ITEK KORRELATOR]
Gerhard Lindig *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 219-223 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20670# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE FUTURE OF ANALYTICAL EVALUATION EQUIPMENT [ERWARTUNGEN AN ANALYTISCHE AUSWERTEGERAETE]
Karl Schuerer *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 225-227 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20671# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DIGITAL MAP BASES FROM PHOTOGRAMMETRIC MEASUREMENTS [DIGITALE KARTENGRUNDLAGEN AUS PHOTOGRAMMETRISCHEN MESSUNGEN]
Hermann G. Neubauer *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 229-231 In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20672# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
TASKS AND POSSIBILITIES OF DIGITAL IMAGE DATA PROCESSING IN PHOTOGRAMMETRY [AUFGABEN UND MOEGLICHKEITEN DER DIGITALEN BILDVERARBEITUNG IN DER PHOTOGRAMMETRIE]
Bernd-Siegfried Schultz *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 233-235 In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20673# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
AIRPORT OBSTACLE MAPS [FLUGPLATZ HINDERNISKARTEN]
Heinz Bannach *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1974 p 237-240 In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20675# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
ON THE DISPLACEMENT PROBLEM AS PART OF A PROCESS IN GENERALIZING TOPOGRAHICAL MAPS. PROPOSITION FOR HIERARCHICAL ORDER AND THE SEARCH FOR EDP ASSISTED SOLUTIONS [ZUM PROBLEM DER VERDRAENGUNG ALS TEILVORGANG DER GENERALISIERUNG TOPOGRAPHYISCHER KARTEN. HIERARCHIEVORSCHLAG UND VERSUCH EINER EDV-GESTUETZTEN LOESUNG]
Roland Schittenhelm *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. No. 74 1978 p 5-19 refs In GERMAN; ENGLISH summary (For primary document see N80-20674 11-42)
Avail: NTIS HC A05/MF A01

N80-20676# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
TWENTY-FIVE YEARS OF AERIAL PHOTOGRAPHY BY THE INSTITUTE OF APPLIED GEODESY [JAHRE LUFTBILDNACHWEIS DES INSTITUTS FUER ANGEWANDTE GEODAESIE]
Heinz Schmidt-Falkenberg *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. No. 74 1978 p 21-38 refs In GERMAN; ENGLISH summary (For primary document see N80-20674 11-42)
Avail: NTIS HC A05/MF A01

N80-20677# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
***A SYMBOL DISK WITH INTERCHANGEABLE SYMBOLS* AND ITS APPLICATIONS TO CARTOGRAPHY [EINE SYMBOLSCHEIBE MIT AUSWECHSELBAREN SYMBOLEN *UND IHRE EINSATZMOEGLICHKEIT IN DER KARTOGRAPHIE*]**
Helmut Uhrig *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. No. 74 1978 p 39-53 refs In GERMAN; ENGLISH summary (For primary document see N80-20674 11-42)
Avail: NTIS HC A05/MF A01

N80-20680# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
A PROGRAM FOR THE FULLY AUTOMATED DISPLACEMENT OF POINT AND LINE FEATURES IN CARTOGRAPHIC GENERALIZATION
Fred Christ *In its* Rept. on Cartography and Topographical Meas. Ser. 2: Transl. 1978 p 5-30 refs (For primary document see N80-20679 11-42)
Avail: NTIS HC A07/MF A01

N80-20681# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
A DIGITAL TERRAIN MODEL FOR LARGE SURFACES AND DIRECT STORAGE ACCESS
Rainer Detering *In its* Rept. on Cartography and Topographical Meas. Ser. 2: Transl. 1978 p 31-34 refs (For primary document see N80-20679 11-42)
Avail: NTIS HC A07/MF A01

N80-20682# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE PRODUCTION OF PHOTOMAPS FROM TIDAL FLAT AREAS
Guenter Hake *In its* Rept. on Cartography and Topographical Meas. Ser. 2: Transl. 1978 p 35-41 refs (For primary document see N80-20679 11-42)
Avail: NTIS HC A07/MF A01

N80-20683# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
TESTING THE ACCURACY OF CARTOGRAPHIC EQUIPMENT: FIRST RESULTS
Theodor Johannsen *In its* Rept. on Cartography and Topographical Meas. Ser 2: Transl. 1978 p 43054 refs (For primary document see N80-20679 11-42)
Avail: NTIS HC A07/MF A01

N80-20685# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
LOCATIONAL CHARACTERISTICS AND THE SEQUENCE OF COMPUTER ASSISTED PROCESSES OF CARTOGRAPHIC GENERALIZATION
Werner Lichtner *In its* Rept. on Cartography and Topographical Meas. Ser. 2: Transl. 1978 p 65-75 refs (For primary document see N80-20679 11-42)
Avail: NTIS HC A07/MF A01

N80-20686# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
COMPUTER-ASSISTED THEMATIC MAPPING FOR FEDERAL PLANNING
Wolf-Dieter Rase *In its* Rept. on Cartography and Topographical Meas. Ser. 2: Transl. 1978 p 77-83 refs (For primary document see N80-20679 11-42)
Avail: NTIS HC A07/MF A01

N80-20687# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DIGITIZING OF GEOMETRIC DATA FOR THEMATIC MAPPING: STATE-OF-THE-ART AND FUTURE DEVELOPMENTS
Klaus Tuerke *In its* Rept. on Cartography and Topographical Meas. Ser. 2: Transl. 1978 p 85-91 refs (For primary document see N80-20679 11-42)
Avail: NTIS HC A07/MF A01

N80-20690# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
MAP PROJECTION CHANGE: SOME PROGRAMS FOR THE TRANSFORMATION OF THE CONTENTS OF AVAILABLE MAPS ACCORDING TO DIFFERENT MAP PROJECTIONS
Ingo Wilski *In its* Rept. on Cartography and Topographical Meas. Ser. 2: Transl. 1978 p 115-127 refs (For primary document see N80-20679 11-42)
Avail: NTIS HC A07/MF A01

N80-20692# Bayerische Akademie der Wissenschaften, Munich (West Germany).
IMPROVED TABLES OF COORDINATES ALLOTTED TO THE WETZELL SATELLITE TRACKING STATION [VERBESSERTE UND ERGAENZTE KOORDINATENVERZEICHNISSE FUER DEN BEREICH DER SATELLITENBEOBACHTUNGSSTATION WETTZELL]
Eberhard Billich and Hermann Seeger *In its* Res. Program 78,

Satellite Geodesy Program 1978 p 18-28 ref In GERMAN (For primary document see N80-20691 11-42)
Avail: NTIS HC A09/MF A01

N80-20702# Bayerische Akademie der Wissenschaften, Munich (West Germany).
THE RGST CHAIN PROGRAM FOR THE DETERMINATION OF POTENTIAL COEFFICIENTS AND STATION COORDINATES [DIE REST-PROGRAMMKETTE FUER DIE BESTIMMUNG VON POTENTIALKOEFFIZIENTEN UND STATIONSKOORDINATEN]
Christoph Reigber *In its* Res. Program 78, Satellite Geodesy Program 1978 p 111-119 refs In GERMAN (For primary document see N80-20691 11-42)
Avail: NTIS HC A09/MF A01

N80-20704# Bayerische Akademie der Wissenschaften, Munich (West Germany).
STUDY FOR A PROJECT FOR A EUROPEAN HIGH PRECISION LASER NETWORK [PROJEKTSTUDIE FUER SATELLITEN-LASERNETZ HOECHSTER GENAUIGKEIT IN EUROPA]
Walter Ehrnsperger and Martha Naebauer *In its* Res. Program 78, Satellite Geodesy Program 1978 p 139-158 refs In GERMAN; ENGLISH summary (For primary document see N80-20691 11-42)
Avail: NTIS HC A09/MF A01

N80-20706# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
CONTRIBUTIONS TO THE CREATION OF A CONCLUSIVE SYSTEM OF CONCEPTS OF PHOTOGRAMMETRY AND AERIAL PHOTOGRAPH CARTOGRAPHY [BEITRAG ZUM AUFBAU EINES GESCLOSSENEN BEGRIFSSYTEMS DER PHOTOGRAMMETRIES UND DER LUFTBILDKARTOGRAPHIES]
Heinz Schmidt-Falkenberg *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. 1978 p 7-35 refs In GERMAN; ENGLISH summary (For primary document see N80-20705 11-42)
Avail: NTIS HC A09/MF A01

N80-20707# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE PROBLEM OF OBTAINING DATA FOR THE DIGITAL HEIGHT MODEL [PROBLEME DER DATENGEWINNUNG FUER DAS DIGITALE HOEHENMODELL]
Gerhard Lindig *In its* Rept. on Cartography and Topographical meas. Ser. 1: Original Rept. 1978 p 37-48 refs In GERMAN; ENGLISH summary Presented at Intern. Symp. der IGP, Komm 3, Moscow, 1978 (For primary document see N80-20705 11-42)
Avail: NTIS HC A09/MF A01

N80-20708# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
A METHOD FOR EXAMINING RELATIONSHIPS BETWEEN MULTISPECTRAL DATA [EINE METHODE ZUE PRUEFUNG CON ABHAENGIGKEITEN ZWISCHEN MULTISPEKTRALEN DATEN]
Bernd-Siefgried Schulz *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. 1978 p 49-69 refs In GERMAN; ENGLISH summary (For primary document see N80-20705 11-42)
Avail: NTIS HC A09/MF A01

N80-20709# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
SETTING DATA FROM MULTISTAGE ANALYTICAL ORIENTATION [EINSTELLDATEN AUS MEHRSTUFIGEN ANALYTISCHEN ORIENTIERUNGSVORGAENGEN]
Karl Schuerer *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. 1978 p 71-84 refs In GERMAN; ENGLISH summary (For primary document see N80-20705 11-42)
Avail: NTIS HC A09/MF A01

N80-20710# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
POSSIBILITIES OF APPLICATION OF LANDSAT AND SKYLAB DATA TO SMALL SCALE CARTOGRAPHY [VERWENDUNGSMOEGLICHKEITEN VON LANDSAT UND SKYLABAUFNAHMEN IN DER KLEIMASSTAEBIGEN KARTOGRAPHIES]
Klaus Niemz *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. 1978 p 85-140 refs In GERMAN; ENGLISH summary (For primary document see N80-20705 11-42)
Avail: NTIS HC A09/MF A01

N80-20711# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
ON THE WRITING ACCURACY OF THE REPRODUCTION UNIT OF THE OPTRONICS SYSTEM P1700 [ZUR SCHRIEBGENAUIGKEIT DER WEIDERGABEEINHEIT IM OPTRONICS SYSTEM P1700]
Bernd-Siegfried Schulz *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. 1978 p 141-148 In GERMAN; ENGLISH summary (For primary document see N80-20705 11-42)
Avail: NTIS HC A09/MF A01

N80-20712# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
PRODUCTION OF COLOR COMPOSITES FORM MULTISPECTRAL DATA RECORDS [DIE HERSTELLUNG VON FARBKOMPOSITEN AUS MULTISPEKTRALAUFNAHMEN]
Hans Peter Groetsch *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. 1978 p 149-160 In GERMAN; ENGLISH summary (For primary document see N80-20705 11-42)
Avail: NTIS HC A09/MF A01

N80-20715*# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
ON ORBITAL FITTING WITH ALTIMETER DATA
D. Leigemann *In its* Inform. Relative to Cartography and Geodesy. Ser. 2: Transl. 1978 p 5-34 refs (For primary document see N80-20714 11-42)
(Contract NAS5-2481)
Avail: NTIS HC A03/MF A01

N80-20716# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
ON A MATHEMATICAL MODEL FOR REMOTE SENSING ALTIMETRY
D. Leglemann *In its* Inform. Relative to Cartography and Geodesy. Ser. 2: Transl. p 35-42 refs Presented at 1st Gen. Assem. of European Assoc. Sensing Lab., Strasbourg, 23-24 Mar. 1977 (For primary document see N80-20714 11-42)
Avail: NTIS HC A03/MF A01

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N80-20806 North Carolina State Univ. at Raleigh.
COMPARISON OF THEORETICAL AND EXPERIMENTAL SOLAR CELL PERFORMANCE Ph.D. Thesis
Ching Yuh Robert Fang 1979 235 p
Avail: Univ. Microfilms Order No. 8005560

A detailed comparison of the theoretically predicted performance of silicon solar cells and the experimentally observed performance is presented. The comparison includes the dark one

through five characteristics, the spectra response characteristics, and one through five characteristics under air mass zero illumination. In general it is found that the agreement between theory and experimental behavior is very good. This good agreement is obtained for a variety of cells fabricated with junction depths ranging from 0.1 micrometer to more than 1 micrometer and for base layer resistivities from 10 ohms-cm to 0.1 ohms-cm. Dissert. Abstr.

N80-20807 Rensselaer Polytechnic Inst., Troy, N. Y.
A COMPARATIVE STUDY OF THE ENERGY ALTERNATIVES FOR THE STATE OF NEW YORK Ph.D. Thesis
Lewis Chester Cohen 1979 303 p
Avail: Univ. Microfilms Order No. 7922226

The energy supply and demand picture for the State of New York is examined. The alternatives available to meet future needs are compared. The subject matter is addressed in an interdisciplinary fashion, focusing on the economic, health, environmental, and technological state of the art of the various options. Major economic factors affecting the energy supply problem are illustrated. Various energy alternatives are discussed, which include coal use for gasification versus electrification, large scale generation of electricity, cogeneration, district heating and total energy systems, low lead hydrogeneration of electricity, fuels from biomass, wood, solid waste, solar, and wind. A suggested optimal energy path is developed, along with a scenario of how energy needs should be met. Dissert. Abstr.

N80-20808* National Aeronautics and Space Administration. Pasadena Office, Calif.
PORTABLE HEATABLE CONTAINER Patent
Lien C. Yang, inventor (to NASA) (JPL) Issued 18 Mar. 1980 5 p Filed 19 Apr. 1978 Supersedes N78-24554 (16 - 15, p 2002) Sponsored by NASA
(NASA-Case-NPO-14237-1; US-Patent-4,193,388; US-Patent-Appl-SN-897831; US-Patent-Class-126-263; US-Patent-Class-149-15; US-Patent-Class-149-37; US-Patent-Class-220-429) Avail: US Patent and Trademark Office CSCL 10B

A container is provided which can be designed to heat its outer surface to sterilize it, or to heat its inner surface and any contents therewithin. In a container that self sterilizes its outer surface, the container includes a combustible layer of thermite-type pyrotechnic material which can be ignited to generate considerable heat, and a thin casing around the combustible layer which is of highly thermally conductive materials such as aluminum which can be heated to a high temperature by the ignited combustible layer. A buffer layer which may be of metal, lies within the combustible layer, and a layer of insulation such as Teflon lies within the buffer layer to insulate the contents of the container from the heat.

Official Gazette of the U.S. Patent and Trademark Office

N80-20809 Florida Univ., Gainesville.
STUDIES OF P-N JUNCTION SILICON SOLAR CELLS Ph.D. Thesis
Shing Chong Pao 1979 104 p
Avail: Univ. Microfilms Order No. 8005484

A silicon solar cell structure which makes use of the positive charges in a passivating silicon dioxide layer to induce a high-low junction in the front emitter surface is designed, fabricated, and analyzed. It is shown experimentally that this structure avoids the degrading effects associated with heavily doped regions and exhibits high values of open circuit voltage. Experimental methods are developed to determine parameters that influence the performance of conventional silicon p-n junction solar cells. One of these methods, which employs the temperature dependence measurement of the minority carrier recombination current in a thin transparent emitter, allows determination of energy bandgap narrowing in heavily doped regions having doping concentrations up to about 10 to the 21 power per cu cm. A second method determines the effective surface recombination velocity describing the high-low junction in a back surface field solar cell. As an additional result, this method provides an estimate of the carrier lifetime in both high and low injection levels. Dissert. Abstr.

N80-20810* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
COMBINED SOLAR COLLECTOR AND ENERGY STORAGE SYSTEM Patent
Ronald N. Jensen, inventor (to NASA) Issued 11 Mar. 1980 6 p Filed 28 Apr. 1978 Supersedes N78-23567 (16 - 14, p 1868)
(NASA-Case-LAR-12205-1; US-Patent-4,192,290; US-Patent-Appl-SN-900843; US-Patent-Class-126-437; US-Patent-Class-126-434; US-Patent-Class-165-32; US-Patent-Class-126-419) Avail: US Patent and Trademark Office CSCL 10A

A combined solar energy collector, fluid chiller and energy storage system is disclosed. A movable interior insulated panel in a storage tank is positionable flush against the storage tank wall to insulate the tank for energy storage. The movable interior insulated panel is alternately positionable to form a solar collector or fluid chiller through which the fluid flows by natural circulation. Official Gazette of the U.S. Patent and Trademark Office

N80-20811 California Univ., Los Angeles.
ENERGY CONSERVATION IN THE US: SOME INTERDISCIPLINARY APPROACHES WITH AN EMPHASIS ON INDUSTRIAL COGENERATION Ph.D. Thesis
Ali Khaki-Kashani 1979 273 p
Avail: Univ. Microfilms Order No. 8007434

The potential for energy conservation in the United States through industrial cogeneration and energy recovery from municipal solid waste was evaluated. Candidate industries with the highest potential for industrial cogeneration were identified, current and advanced energy conversion systems for cogeneration were analyzed and various cogeneration strategies to maximize the potential fuel savings, were considered. Future market potential, potential energy savings, and the national benefits of industrial cogeneration were studied. Technical analyses for cogeneration systems were performed at several industrial sites and detailed institutional, environmental, and economic analyses were conducted for major categories of institutional settings. The impact of the National Energy Act on the commercialization of industrial cogeneration was discussed. The current status of the various processes available for energy recovery from municipal solid waste was assessed along with the costs associated with each process. Dissert. Abstr.

N80-20812*# Motorola, Inc., Phoenix, Ariz.
MARKET DEFINITION STUDY OF PHOTOVOLTAIC POWER FOR REMOTE VILLAGES IN THE UNITED STATES
Clyde Ragsdale and Prosper Quashie Feb. 1980 71 p
(Contract DEN3-49; Contract DE-AI01-79ET-20485)
(NASA-CR-159800; DOE/NASA/0049-80/1) Avail: NTIS HC A04/MF A01 CSCL 10B

A grass roots evaluation of the market potential was carried out for photovoltaic applications in remote villages in the U. S. and its possessions. An estimate of almost 14 MWp available for conversion from a potential to a real market was defined. The total power potential was based on the energy needs of almost 400 sites reported by Federal agencies and inputs from over 100 Indian tribes. The methodology used, the results achieved, and some recommendations of how to convert this domestic market potential into a real market are detailed. R.E.S.

N80-20813*# Honeywell, Inc., Minneapolis, Minn.
QUALIFICATION TEST PROCEDURES AND RESULTS FOR HONEYWELL SOLAR COLLECTOR SUBSYSTEM, SINGLE-FAMILY RESIDENCE
Washington, D.C. DOE Feb. 1977 43 p Prepared for NASA and DOE
(Contract NAS8-32093)
(NASA-CR-161382) Avail: NTIS HC A03/MF A01 CSCL 10B

The test procedures and results in qualifying the Honeywell single family residence solar collector subsystem are presented. Testing was done in the following areas: pressure, service loads, hail, solar degradation, pollutants, thermal degradation, and outgassing. R.E.S.

N80-20814*# Pennsylvania Univ., Philadelphia. Moore School of Electrical Engineering.
ANALYSIS AND EVALUATION IN THE PRODUCTION PROCESS AND EQUIPMENT AREA OF THE LOW-COST

SOLAR ARRAY PROJECT Quarterly Report, May - Aug. 1979
H. Goldman and M. Wolf Aug. 1979 63 p refs Prepared for JPL and DOE
(Contract JPL-954796)
(NASA-CR-162904; DOE/JPL-954796-79/7) Avail: NTIS HC A04/MF A01 CSCL 10A

The energy consumed in manufacturing silicon solar cell modules was calculated for the current process, as well as for 1982 and 1986 projected processes. In addition, energy payback times for the above three sequences are shown. The module manufacturing energy was partitioned two ways. In one way, the silicon reduction, silicon purification, sheet formation, cell fabrication, and encapsulation energies were found. In addition, the facility, equipment, processing material and direct material lost-in-process energies were appropriated in junction formation processes and full module manufacturing sequences. A brief methodology accounting for the energy of silicon wafers lost-in-processing during cell manufacturing is described. Author

N80-20815*# Optical Coating Lab., Inc., City of Industry, Calif. Photoelectronics Div.
DEVELOPMENT OF LOW COST CONTACTS TO SILICON SOLAR CELLS Quarterly Report, 15 Oct. 1979 - 15 Jan. 1980
D. P. Tanner Jan. 1980 31 p refs Prepared for JPL and DOE
(Contracts JPL-955244)
(NASA-CR-162905; DOE/JPL-955244-80/4) Avail: NTIS HC A03/MF A01 CSCL 10A

The results of the second phase of the program of developing low cost contacts to silicon solar cells using copper are presented. Phase 1 yielded the development of a plated Pd-Cr-Cu contact system. This process produced cells with shunting problems when they were heated to 400 C for 5 minutes. Means of stopping the identified copper diffusion which caused the shunting were investigated. A contact heat treatment study was conducted with Pd-Ag, Ci-Ag, Pd-Cu, Cu-Cr, and Ci-Ni-Cu. Nickel is shown to be an effective diffusion barrier to copper. J.M.S.

N80-20816*# Mobil Tyco Solar Energy Corp., Waltham, Mass.
LARGE AREA SILICON SHEET BY EFG Annual Progress Report, 1 Oct. 1978 - 30 Sep. 1979
14 Mar. 1980 74 p refs Sponsored in part by DOE
(Contract JPL-954355)
(NASA-CR-162907; JPL-9950-313; DOE/JPL-954355-79/11) Avail: NTIS HC A04/MF A01 CSCL 10A

Recent advances toward silicon growth stations and improved electronic quality of multiplesilicon are discussed. These advances were made in large measure by studies in which the composition of the gas environment around the meniscus area was varied. By introducing gases such as CO2, CO, and CH4 into this region, reproducible increases in diffusion length and cell performance were realized, with the best large area (5 cm x 10 cm) cells exceeding 11% efficiency. R.E.S.

N80-20817*# Sensor Technology, Inc., Chatsworth, Calif.
PHASE 2: ARRAY AUTOMATED ASSEMBLY TASK LOW COST SILICON SOLAR ARRAY PROJECT Quarterly Technical Report, Oct. - Dec. 1979
Gregory T. Jones Dec. 1979 39 p Prepared for JPL and DOE
(Contract JPL-954865)
(NASA-CR-162912; JPL-9950-316; DOE/JPL-954865-79/8; QTR-8) Avail: NTIS HC A03/MF A01 CSCL 10A

Several microwave systems for use in solar cell fabrication were developed and experimentally tested. The first system used a standing wave rectangular waveguide horn applicator. Satisfactory results were achieved with this system for impedance matching and wafer surface heating uniformity. The second system utilized a resonant TM sub 011 mode cylindrical cavity but could not be employed due to its poor energy coupling efficiency. The third and fourth microwave systems utilized a circular waveguide operating in the TM sub 01 and TM sub 11 but had problems with impedance matching, efficiency, and field uniformity. R.E.S.

N80-20818*# Eagle-Picher Industries, Inc., Miami, Okla. Miami Research Labs.
STUDY PROGRAM TO DEVELOP AND EVALUATE DIE AND CONTAINER MATERIALS FOR THE GROWTH OF SILICON RIBBONS Final Report
L. A. Addington, P. D. Ownby, B. B. Yu, M. W. Barsoum, H. V. Romero, and B. G. Zealer Dec. 1979 124 p refs
(Contracts NAS7-100; JPL-954877)
(NASA-CR-162899; DOE/JPL-954877-79/6; JPL-9950-309) Avail: NTIS HC A06/MF A01 CSCL 10A

The development and evaluation of proprietary coatings of pure silicon carbide, silicon nitride, and aluminum nitride on less pure hot pressed substrates of the respective ceramic materials, is described. Silicon sessile drop experiments were performed on coated test specimens under controlled oxygen partial pressure. Prior to testing, X-ray diffraction and SEM characterization was performed. The reaction interfaces were characterized after testing with optical and scanning electron microscopy and Auger electron spectroscopy. Increasing the oxygen partial pressure was found to increase the molten silicon contact angle, apparently because adsorbed oxygen lowers the solid-vapor interfacial free energy. It was also found that adsorbed oxygen increased the degree of attack of molten silicon upon the chemical vapor deposited coatings. Cost projections show that reasonably priced, coated, molten silicon resistant refractory material shapes are obtainable. J.M.S.

N80-20819*# MB Associates, San Ramon, Calif.
USE OF GLASS REINFORCED CONCRETE (GRC) AS A SUBSTRATE FOR PHOTOVOLTAIC MODULES Final Report
James L. Eirls 12 Mar. 1980 109 p refs
(Contracts NAS7-100; JPL-955281)
(NASA-CR-162898; DOE/JPL-955281-80/4; JPL-9950-300; MB-R-80/05) Avail: NTIS HC A06/MF A01 CSCL 10A

A substrate for flat plate photovoltaic solar panel arrays using a glass fiber reinforced concrete (GRC) material was developed. The installed cost of this GRC panel is 30% less than the cost goal of the Near Term Low-Cost Flat Plate Photovoltaic Solar Array Program. The 4 ft by 8 ft panel is fabricated from readily available inexpensive materials, weighs a nominal 190 lbs., has exceptionally good strength and durability properties (rigid and resists weathering), is amenable to mass production and is easily installed on simple mountings. Solar cells are encapsulated in ethylene/vinyl acetate with Tedlar backing and Korad cover film. The laminates are attached to the GRC substrate with acrylic transfer tape and edge sealed with silicone RTV adhesive. J.M.S.

N80-20820*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE 1979 GODDARD SPACE FLIGHT CENTER BATTERY WORKSHOP
Gerald Halpert, ed. Apr. 1980 521 p refs Workshop held in Greenbelt, Md., 13-15 Nov. 1979
(NASA-CP-2117) Avail: NTIS HC A22/MF A01 CSCL 10C

Papers discussing the latest results of testing, analysis, and development of the sealed nickel cadmium cell system are presented. Metal hydrogen and lithium cell technology and applications are also discussed. The purpose of the workshop was to share flight and test experience, stimulate discussion on problem areas, and to review the latest technology improvements. For individual titles, see N80-20821 through N80-20863.

N80-20821*# National Aeronautics and Space Administration, Washington, D. C.
OVERVIEW OF NASA BATTERY TECHNOLOGY PROGRAM
Robert W. Riebling *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 5-11 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

Highlights of NASA's technology program in batteries for space applications are presented. Program elements include: (1) advanced ambient temperature alkaline secondaries, which are primarily nickel-cadmium cells in batteries; (2) a toroidal nickel cadmium secondaries with multi-kilowatt-hour storage capacity primarily for lower orbital applications; (3) ambient temperature lithium batteries, both primary and secondaries,

primarily silver hydrogen and high-capacity nickel hydrogen.
R.E.S.

N80-20822*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RECOMMENDATIONS OF OSTA FLIGHT TECHNOLOGY IMPROVEMENT WORKSHOP-POWER SUBSYSTEMS PANEL
Luther W. Slifer, Jr. *In its* The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 13-27 refs (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The recommendations of the power subsystems panel are discussed. The thrust is directed at radiometric problems. Areas that need development are defined for both spacecraft power subsystems and power supplies for experiments and instruments.
R.E.S.

N80-20823*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PANEL DISCUSSION: BRIDGING THE GAP TECHNOLOGY DEVELOPING FLIGHT HARDWARE
Floyd E. Ford *In its* The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 29-46 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The development of an engineering data base for aerospace batteries is discussed.
R.E.S.

N80-20824*# Army Electronics Research and Development Command, Fort Monmouth, N. J.
LITHIUM CELL TECHNOLOGY AND SAFETY REPORT OF THE TRI-SERVICE LITHIUM SAFETY COMMITTEE
Edward Reiss *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 47-55 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The organization of the Tri-Service Lithium Safety Committee is described. The following areas concerning lithium batteries are discussed: transportation--DOT Exemption 7052, FAA; disposal; storage; individual testing/test results; and battery design and usage.
R.E.S.

N80-20825*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
NASA/MARSHALL'S LITHIUM BATTERY APPLICATIONS
L. E. Paschal *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 57-68 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

A general lithium battery is described and a summary of lithium battery applications is presented. Four aspects of a particular lithium battery, the inducement environmental contamination monitoring battery, are discussed-design and construction details, thermal vacuum tests, projection tests, and acceptance tests.
R.E.S.

N80-20826*# Naval Ocean Systems Center, San Diego, Calif.
HIGH ENERGY DENSITY BATTERY DEVELOPMENT STATUS REPORT
Alvin Willis *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 69-82 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The Navy applications for high energy density batteries are described.
R.E.S.

N80-20827*# Honeywell Power Sources Center, Horsham, Pa.
GALILEO LITHIUM/SO2
Larry Blagdon *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 83-95 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The current status of the Galileo lithium SO2 battery is described. The following general requirements of the battery are discussed: (1) electrical characteristics, (2) storage, (3) reliability, and (4) performance.
R.E.S.

N80-20828*# Mallory (P. R.) and Co., Inc., Burlington, Mass.
SULFUR STUDIES ON LITHIUM SULFUR DIOXIDE BATTERIES
A. N. Dey *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 97-110 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

Studies investigating the chemistry of the lithium SO2 batteries are described.
R.E.S.

N80-20829*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ELECTRICAL, THERMAL AND ABUSIVE TESTS ON LITHIUM THIONYL CHLORIDE CELLS
Harvey Frank *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 111-119 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

Electrical characterizations, thermal characterizations, and outer limits tests of lithium thionyl chloride cells are discussed. Graphs of energy density vs power density and heat rate vs time are presented along with results of forced reversal and high rate discharge tests.
K.L.

N80-20830*# GTE Labs., Inc., Waltham, Mass.
LITHIUM THIONYL CHLORIDE HIGH RATE DISCHARGE
Keith A. Klinedinst *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 121-133 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

Improvements in high rate lithium thionyl chloride power technology achieved by varying the electrolyte composition, operating temperature, cathode design, and cathode composition are discussed. Discharge capacities are plotted as a function of current density, cell voltage, and temperature.
K.L.

N80-20831*# Boeing Aerospace Co., Seattle, Wash.
LITHIUM BATTERY DISCHARGE TESTS
Chris J. Johnson *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 135-146 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The long term discharge of a variety of lithium cells was characterized and the susceptibility of the cells to chemical variation during the slow discharge was tested. A shunt resistor was set across the terminals to monitor the voltage as a function of time. Failures were identified by premature voltage drops.K.L.

N80-20832*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CHARACTERIZATION OF PROTOTYPE SECONDARY LITHIUM BATTERY
Robert Somoano *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 147-154 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The performance characteristics of ambient temperature secondary lithium batteries were determined through continuous cycle tests with periodic current and voltage measurements. Cycle life of the lithium anode was found to be an important problem area as was the formation of dentrite breakage and subsequent shorting. Energy density was increased by using more efficient cathode structures.
K.L.

N80-20833*# EIC, Inc., Newton, Mass.
RECHARGEABLE AMBIENT TEMPERATURE LITHIUM CELLS
Gerhard Holleck *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 155-167 refs (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The cycling performance of a secondary lithium cell with a 2-methyl THF lithium hectofluorarsenate electrolyte is discussed. Stripping efficiency, dendritization, passivation on standing, and discharge efficiency are considered.
K.L.

N80-20834*# Exxon Enterprises, Inc., Somerville, N.J. Battery Div.

THE EXXON RECHARGEABLE CELLS
Paul A. Malachesky *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 169-178 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The design and performance of ambient temperature secondary cells based on the titanium disulfide cathode are discussed. These limited performance products were developed for microelectronic applications such as solar rechargeable watches and clocks which require low drain rate and do not require many deep cycles. K.L.

N80-20835*# Power Conversion, Inc., Mount Vernon, N. Y.
HIGH TEMPERATURE STORAGE CHARACTERISTICS OF LITHIUM SULFUR DIOXIDE CELLS
Tom Watson *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 179-188 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

Hermetically sealed SO2 cells were developed to eliminate SO2 diffusion and its adverse effects on shelf life. A two part barrier coating material was applied to the internal surface of the glass seal and cured under a predetermined thermal profile in order to prevent the self discharge associated with glass seal corrosion. K.L.

N80-20836*# Space and Missile Systems Organization, Los Angeles Air Force Station, Calif.
NATO: IN-ORBIT EXPERIENCE
John J. Capulli *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 191-203 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The performance of the NATO-111-A and NATO 111-B satellite battery is reported. The electrical power subsystem is briefly described. The electrical characteristics and the reconditioning experience of the batteries is cited. The in-orbit experience is compared with results of preflight accelerated life tests.J.M.S.

N80-20837*# RCA American Communications, Inc., Piscataway, N. J.
RCA SATCOM: IN-ORBIT EXPERIENCE
Paul W. DeBaylo and Stephen J. Gaston (RCA Astro-Electronics) *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 205-213 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01

The system characteristics of the Satcom batteries and Satcom power system are briefly discussed. Performance of the nickel cadmium 22 cell batteries onboard in parallel with independent redundant charges providing the charge rates is reported. Performance onboard reconditioning with individual cell bypasses with 1 ohm resistors is discussed for the F-1 and F-2 spacecraft. J.M.S.

N80-20838*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
UPDATE OF THE IUE BATTERY IN-FLIGHT PERFORMANCE
Smith E. Tiller *In its* The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 215-229 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The in-flight performance data of two 17-cell, 6-ampere-hour nickel cadmium spacecraft batteries are presented covering 22 months of operation. Fluctuations in the battery voltage and the battery temperature are presented for spacecraft movement throughout a beta range of 0 to 130 deg. The battery discharge voltages during the peak eclipse seasons, daily seasons, and daily eclipse periods are noted. Finally, the spacecraft data are compared to data from a 6-ampere-hour test pack and test flight data. M.G.

N80-20839*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DISCUSSION OF THE SAGE ANOMALY
David Baer *In its* The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 231-241 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The performance of a nine-ampere-hour, nickel cadmium cell operating in a satellite power system is examined. Data for battery average dissipation, voltage profiles, battery temperatures, and the percent of recharge versus orbit are presented. The occurence of undervoltage and increased recharge/orbit percentages are examined and suggestions are made as to their causes. M.G.

N80-20840*# European Space Agency, Noordwikj (Netherlands).
ESA BATTERY DEVELOPMENT
H. J. Young and D. Goudot *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 243-259 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The improvement of nickel cadmium batteries and the development of a silver hydrogen cell for spacecraft power systems are discussed. The design of nickel cadmium batteries is examined with a particular emphasis on weight reduction concepts. Results from performance tests on silver hydrogen cells are given and comparisons are made with current nickel cadmium cells. M.G.

N80-20841*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
PARALLEL 50 AMPERE HOUR NICKEL CADMIUM BATTERY PERFORMANCE IN THE MODULAR POWER SUBSYSTEMS (MPS)
Donald A. Webb *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 261-268 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The thermal performance of 50-ampere-hour, nickel cadmium batteries for use in a modular spacecraft is examined in near-Earth orbit simulation. Battery voltage and temperature profiles for temperature extreme cycles are given and discussed. M.G.

N80-20842*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
NASA 50 AMP HOUR NICKEL CADMIUM BATTERY WASTE HEAT DETERMINATION
Vernon C. Mueller *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 269-275 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

A process for determining the waste heat generated in a 50-ampere-hour, nickel cadmium battery as a function of the discharge rate is described and results are discussed. The technique involved is essentially calibration of the battery as a heat transfer rate calorimeter. The tests are run at three different levels of battery activity, one at 40-watts of waste heat generated, one at 60, and one at 100. Battery inefficiency ranges from 14 to 18 percent at discharge rates of 284 to 588 watts, respectively and top-of-cell temperatures of 20 C. M.G.

N80-20843*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE LDEF HEAT PIPE EXPERIMENT POWER SYSTEMS
Smith E. Tiller *In its* The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 277-284 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

A heatpipe experiment for a long duration exposure facility is described. The design and configuration of the power system of the spacecraft is reported with emphasis placed on its solar array panels, 12-ampere hour 18-cell nickel battery, and its electronic controller. R.C.T.

N80-20844*# Ford Aerospace and Communications Corp., Palo Alto, Calif.
THE 20 WATT-HOUR PER KILOGRAM NICKEL CADMIUM ENERGY STORAGE FOR INTELSAT V
Jon Armantrout *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 287-306 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The life durability of a nickel cadmium energy storage battery for the INTELSAT 5 Satellite is discussed. Configuration

performance characteristics of the battery are given as well as a summary of some of the flight battery tests. R.C.T.

N80-20845*# TRW, Inc., Redondo Beach, Calif.
TDRSS BATTERY LIFE CYCLE TESTS INTERIM REPORT
Eddison W. Kipp *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 307-320 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The design features of the tracking and data relay satellite system battery are described. Some of the life cycle tests performed on the battery are reported. R.C.T.

N80-20846*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LIFE TEST RESULTS OF THE NASA STANDARD 20 AMPERE HOUR CELLS
Gerald Halpert *In its* The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 321-330 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The data collected from life cycle tests results of a 20-ampere cells are discussed. A total of 50 cells were evaluated. R.C.T.

N80-20847*# TRW, Inc., Redondo Beach, Calif.
BATTERY RECONDITIONING, SUMMARY OF TRW EXPERIENCE
Willard R. Scott *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 331-342 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The data collected from the results of battery reconditioning accumulated from three different spacecraft programs are summarized. The basic design characteristics of the programs are also presented. R.C.T.

N80-20848*# TRW, Inc., Redondo Beach, Calif.
ADDITIONAL REVERSAL CHARACTERISTICS OF SEALED NICKEL CADMIUM CELLS
Paul F. Ritterman *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 343-354 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The reversal characteristics of nickel cadmium cells are discussed. The evolution of hydrogen from the positive electrode is described when the nickel cadmium cell is completely discharged. Results indicate that one ampere hour of overdischarge in reversal can generate enough hydrogen to increase the cell pressure of an average size cell, 20- to 50-ampere hour cell, by 120 psi. R.C.T.

N80-20849*# Aerospace Corp., Los Angeles, Calif.
REVERSAL OF NICKEL CADMIUM CELLS
Charles Badcock *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 355-365 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The design of nickel cadmium cells are discussed. The pressure voltage profiles of these cells during low rate reversal are also summarized. R.C.T.

N80-20850*# TRW, Inc., Redondo Beach, Calif.
CELL SHORT CIRCUIT, PRESHORT SIGNATURE
Charles Lurie *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 367-375 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

Short-circuit events observed in ground test simulations of DSCS-3 battery in-orbit operations are analyzed. Voltage signatures appearing in the data preceding the short-circuit event are evaluated. The ground test simulation is briefly described along with performance during reconditioning discharges. Results suggest that a characteristic signature develops prior to a shorting event. J.M.S.

N80-20851*# Martin Marietta Corp., Denver, Colo.
POCKET NICKEL CADMIUM CELL AND BATTERY EVALUATION
John W. Lear *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 377-388 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The Nickel Cadmium 129-ampere hour cell was tested in order to characterize the cell under controlled conditions. Results of charge characterization and discharge characterization are reported. Ampere hour efficiency, open circuit stand, and cycle life operation results are included. The battery is briefly described. J.M.S.

N80-20852*# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
NWSC NICKEL CADMIUM SPACECRAFT CELL ACCELERATED LIFE TEST PROGRAM DATA ANALYSIS
John Lander *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 391-406 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

An analysis of the data leading to a proposed accelerated life test scheme to test a nickel cadmium cell under spacecraft usage conditions is described. The amount and concentration of electrolyte and the amount of precharge in the cell are discussed in relation to the design of the cell and the accelerated test design. A failure analysis of the cell is summarized. The analysis included such environmental test variables as the depth of discharge, the temperature, the amount of recharge and the charge and discharge rate. A.W.H.

N80-20853*# Coppin State Coll., Baltimore, Md.
ACCELERATED TEST DESIGN
Patrick P. McDermott *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 407-417 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The design of an accelerated life test program for electric batteries is discussed. A number of observations and suggestions on the procedures and objectives for conducting an accelerated life test program are presented. Equations based on nonlinear regression analysis for predicting the accelerated life test parameters are discussed. A.W.H.

N80-20854*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DEVELOPMENT OF FAILURE MODEL FOR NICKEL CADMIUM CELLS
Amitava Gupta *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 419-439 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The development of a method for the life prediction of nickel cadmium cells is discussed. The approach described involves acquiring an understanding of the mechanisms of degradation and failure and at the same time developing nondestructive evaluation techniques for the nickel cadmium cells. The development of a statistical failure model which will describe the mechanisms of degradation and failure is outlined. A.W.H.

N80-20855*# Telesat Canada, Ottawa (Ontario).
MISSION SIMULATOR TEST DATA
E. A. Hendee *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 441-452 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

A real time mission simulation test program of nickel cadmium cells, performed in conjunction with the Anik 1A2 satellite, is reviewed. Simulation of the temperature profiles, the electrical profiles, the depth of discharge, and the rate of charge and discharge is reported. The type of separator used in the cells and the transfer of electrolytes during overcharge are discussed. A.W.H.

N80-20856*# Boeing Aerospace Co., Seattle, Wash.
ANALYTICAL MODELING OF BATTERY CYCLE LIFE
Sidney Gross *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980

p 453-459 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

An analytical model related to the physical and chemical processes involved in battery wear and failure is discussed. The model is described using the data from the Crane tests. A.W.H.

N80-20857*# Bell Telephone Labs, Inc., Millington, N.J.
THE PRACTICAL LIMIT OF LOADING NICKEL HYDROXIDE ELECTRODES
E. J. McHenry *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 461-468 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The effect of compression loads on positive nickel hydroxide electrodes is reported. Results show the electrodes could be compressed up to 20,000 kilograms without any change in capacity. A.W.H.

N80-20858*# Bell Telephone Labs., Inc., Murray Hill, N. J.
NICKEL ELECTRODE PLATE THICKENING STUDY
Madeline Bernhardt and Dean W. Maurer *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 471-485 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

The rate of thickening of the nickel electrode with cycling, under geochronous conditions, was investigated. The experimental procedures used to study the effects of various operational parameters on the rate of the thickness growth are outlined. The parameters included temperature, electrolyte composition, manufacturing lot, cycle parameters, and reconditioning methods. A.W.H.

N80-20859*# Eagle-Picher Co., Joplin, Mo.
AEROSPACE ELECTRODE LINE
Lee Miller *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 487-491 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

A facility which produces electrodes for spacecraft power supplies is described. The electrode assembly procedures are discussed. A number of design features in the production process are reported including a batch operation mode and an independent equipment module design approach for transfering the electrode materials from process tank to process tank. A.W.H.

N80-20860*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
UPDATE, COMPARING DIFFERENT PLATE TREATMENTS AND DESIGN
David Baer *In its* The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 493-497 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

Eight electrochemical cells were tested for precycling capacity and compared. The cell design variables included teflon treatment, silver treatment, light loading, and a polypropylene separator. Data are presented in tabular form. A.W.H.

N80-20861*# Ford Aerospace and Communications Corp., Palo Alto, Calif.
INTELSAT-V: NICKEL-HYDROGEN BATTERY
G. VanOmmering *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 499-513 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

A design program for the development of a nickel hydrogen battery is described. The design and design advantages of the battery are discussed. The general characteristics of the battery such as the strain gage cell pressure monitoring and the automatic low temperature heater control are reported along with the performance characteristics. A.W.H.

N80-20862*# Eagle-Picher Co., Joplin, Mo.
AIR FORCE NICKEL-HYDROGEN FLIGHT EXPERIMENT
Lee Miller *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 515-524 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

A gas leakage test, a capacity test, a charge retention test, and an electrolyte leakage test were among the tests conducted on a nickel hydrogen battery in a flight environment. The battery design features and its performance in each test are discussed. A.W.H.

N80-20863*# Rockwell International Corp., Seal Beach, Calif.
NICKEL HYDROGEN CELL CHARACTERIZATION TEST RESULTS
Burt Otzinger *In* NASA. Goddard Space Flight Center The 1979 Goddard Space Flight Center Battery Workshop Apr. 1980 p 525-531 (For primary document see N80-20820 11-44)
Avail: NTIS HC A22/MF A01 CSCL 10C

Charge control studies on nickel hydrogen cells are discussed. Characterization test data for the cells are presented in graphical form. The test areas covered were capacity versus temperature, ampere-hour cycling efficiency, and the charge method which involved voltage level with current limiting. A.W.H.

N80-20864*# General Electric Co., Philadelphia, Pa. Space Div.
MOD 1 WIND TURBINE GENERATOR FAILURE MODES AND EFFECTS ANALYSIS
Feb. 1979 95 p
(Contracts NAS3-20058; EX-77-A-29-1010)
(NASA-CR-159494; DOE/NASA/0058-79/1) Avail: NTIS HC A05/MF A01 CSCL 10B

A failure modes and effects analysis (FMEA) was directed primarily at identifying those critical failure modes that would be hazardous to life or would result in major damage to the system. Each subsystem was approached from the top down, and broken down to successive lower levels where it appeared that the criticality of the failure mode warranted more detail analysis. The results were reviewed by specialists from outside the Mod 1 program, and corrective action taken wherever recommended. A.R.H.

N80-20865*# Honeywell, Inc., Minneapolis, Minn.
SOLAR ENERGY HEATING SYSTEM DESIGN PACKAGE FOR A SINGLE-FAMILY RESIDENCE AT NEW CASTLE, PENNSYLVANIA
Aug. 1977 187 p Prepared for DOE
(Contract NAS8-32093)
(NASA-CR-161356) Avail: NTIS HC A09/MF A01 CSCL 10A

The design of a solar heating and hot water system for a single family dwelling is described. Cost trade studies on the energy conservation and architectural features of the solar house are discussed. The present status of verification for the single family heating system, i.e., proof that the components and the system meet applicable physical and functional requirements, is reported. The system integration drawings, the major subsystems drawings, and the architect's specifications and plans are included. A.W.H.

N80-20866*# Honeywell, Inc., Minneapolis, Minn. Energy Resources Center.
SOLAR HEATING SYSTEM DESIGN PACKAGE FOR A SINGLE-FAMILY RESIDENCE AT WILLIAM O'BRIEN STATE PARK, MINNESOTA
Jul. 1977 173 p Prepared for NASA and DOE
(Contract NAS8-32093)
(NASA-CR-161357) Avail: NTIS HC A08/MF A01 CSCL 10A

The plans, specifications, cost trade studies, and verification status of a prototype solar heating and hot water system for the Minnesota Department of Natural Resources's single-family dwelling located at O'Brien State Park, 30 miles east of Minneapolis, Minnesota are presented. R.E.S.

N80-20867# Army Armament Research and Development Command, Dover, N. J. Management Information Systems Directorate.
THE APPLICATION OF DC-DC ENERGY CONVERSION IN A SOLAR ENERGY SYSTEM Final Report
John P. Tobak Sep. 1979 156 p

(AD-A077112; AD-E400363; ARMID-TR-78002) Avail: NTIS HC A08/MF A01 CSCL 10/2

Expressions of voltage gain, current, and efficiency are developed for each of five different methods of DC-DC energy conversion. One of the five methods is selected as the design model for a prototype converter to be used in solar energy applications. Both the prototype's performance and the test methods employed are described. Efficiencies as high as 86% are measured along with a constant voltage line regulation of 0.04 volts per volt and a constant voltage load regulation of 0.034 volts per ohm. The prototype acts as a constant 12-volt power supply capable of delivering up to 10-amp currents. GRA

N80-20868# Little (Arthur D.), Inc., Cambridge, Mass.
WIND ENERGY IN THE MOUNTAINS OF NEW HAMPSHIRE AS A POTENTIAL ENERGY SOURCE FOR PORTSMOUTH NAVAL SHIPYARD Final Report
William A. Vachon, William T. Downey, Frederic March, Frederick R. Madio, Gerald A. Schimke, and John E. Wade Oct. 1979 188 p
(Contract N00014-79-C-0536; NR Proj. 521-710)
(AD-A076975) Avail: NTIS HC A09/MF A01 CSCL 04/2

A feasibility study was conducted to determine whether the wind energy in the mountainous regions of New Hampshire could be used as a possible energy course for the Portsmouth Naval Shipyard in Portsmouth, New Hampshire. The results indicate that there is adequate wind energy available at mountain sites to drive even the largest wind turbine generators (WT's) now planned, and that many potential sites exist in relatively close proximity to utility lines. Eight specific sites were identified on the basis of available wind speed data, the incidence of severe icing, environmental constraints, plus on-site interpretation of vegetative deformation by the wind (tree flagging). Based on the experiences of this study there appears to be a limited number of available WT sites which have sufficient geographic extent to support large clusters (i.e., farms) of WT's of approximately 20-100 MW rating. Technically, the local utility can 'wheel' power to the Naval Shipyard from mountain sites, but doing so would not be cost-effective for the Shipyard because of an abundance of on-site, low-cost cogenerated electricity. A simple near-term approach to wind power development in New Hampshire appears to be through the private exploitation of WT clusters of less than 5 MW capacity on private land. GRA

N80-20869# Army Electronics Research and Development Command, Fort Monmouth, N. J. Electronics Technology/Devices Lab.
MILITARIZED THERMOELECTRIC POWER SOURCES
G. Guazzoni, A. Herchakowski, and J. Angello Jul. 1979 9 p refs
(IDA Proj. 1L1-62705-AH-94)
(AD-A075609; DELET-TR-79-17) Avail: NTIS HC A02/MF A01 CSCL 10/2

Thermoelectric power sources are being developed to provide multifuel, silent, maintenance free tactical power generators for forward area applications. Recent technology improvements, state of development, and performance characteristics of the 100-Watt and 500-Watt Thermoelectric Power Sources are presented.
Author (GRA)

N80-20870# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
COMPUTER SIMULATION OF A SOLAR ENERGY SYSTEM WHICH UTILIZES FLAT-PLATE COLLECTORS M.S. Thesis
Barry Eugene Prins Dec. 1979 102 p refs
(AD-A079906; AFIT/GAE/AA/79D-15) Avail: NTIS HC A06/MF A01 CSCL 10/2

This thesis is a computer simulation of a solar energy system that utilizes flat-plate solar collectors. By using available data from the U.S. Weather Bureau, the location and orientation of the collector, characteristics of the collector, and the type of storage and backup heat system in use, it is possible to find the amount of solar energy collected and transferred to storage. A life cycle cost analysis can be accomplished by using financial data and an inflation-discount function to reduce all costs to present year dollars. By varying any of a number of parameters the operator can determine what effect it has on the amount of energy collected and the life cycle costs. Results of running the program for a solar water heater system indicate that such a system is cost effective, when compared to a gas water heater system, only when the federal and state tax incentives were taken into account. However, electricity is approximately three times as expensive as gas per BTU of energy gained so the solar energy system is economically feasible when compared to an electric water heating system. GRA

N80-20871# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
N-TYPE MOLYBDENUM DISELENIDE-BASED LIQUID JUNCTION SOLAR CELLS: A NON-AQUEOUS ELECTROLYTE SYSTEM EMPLOYING THE CHLORINE/CHLORIDE COUPLE
Lynn F. Schneemeyer, Mark S. Wrighton, Angelica Stacy, and Michell J. Sienko 19 Dec. 1979 20 p Submitted for publication
Prepared in cooperation with Cornell Univ., Ithaca, N.Y.
(Contract N00014-78-C-0630; NR Proj. 051-696)
(AD-A079712; TR-3) Avail: NTIS HC A02/MF A01 CSCL 10/2

Single crystal, n-type MoSe2 is shown to serve as a stable photoanode in an electrochemical cell employing a nonaqueous (CH3CN) solution of Cl2/Cl(-) as the redox active material. The photoanode reaction is 2Cl(-) Cl2 and the cathode reaction is Cl2 2Cl(-). The MoSe2 is qualitatively better than MoS2 (0.5% efficiency) which has a larger band gap (1.7 eV), but both materials are rugged in the nonaqueous solution while both photocorrode in aqueous Cl(-) solutions. In H2O, the I3(-)/I(-) couple is excellent but in CH3CN it yields lower efficiency than the Cl2/Cl(-) couple. The stable Cl2(-)/Cl(-) system provides evidence that a transparent, reversible, non-O2 sensitive redox couple can be useful in n-type semiconductor-based liquid junction cells employing a direct band gap material having optimum solar response. GRA

N80-20872# Boeing Aerospace Co., Seattle, Wash.
EMERGING MATERIALS SYSTEMS FOR SOLAR CELL APPLICATIONS Cu(2-x)Se Quarterly Technical Progress Report, 1 May - 1 Aug. 1979
R. A. Mickelsen, J. M. Stewart, W. S. Chen, and L. F. Buldhaupt Aug. 1979 17 p refs
(Contract DE-AC04-79ET-23005)
(DOE/ET-23005/T1; QTPR-1) Avail: NTIS HC A02/MF A01

The feasibility of using Cu/sub 2-x7Se as a semiconductor material for the low cost production of photovoltaic solar cells was studied. The emphasis was to produce Cu/sub 2-xSe films of good uniformity and reproducibility. The films are deposited onto glass substrates heated to approximately 200 C. The Cu and Se are evaporated from separate sources, each individually monitored for rate by quartz crystal microbalances. The techniques used are readily adaptable for scale up to large volume production. Preliminary measurements of optical absorption, electron diffraction, and Hall measurements were made. DOE

N80-20873# Thermo Electron Corp., Waltham, Mass.
DOE/JPL ADVANCED THERMIONIC TECHNOLOGY PROGRAM Progress Report, Dec. 1978 - Jan. 1979
1979 63 p refs
(Contract EY-76-C-02-3056)
(COO-3056-37; PR-37) Avail: NTIS HC A04/MF A01

Continuing research on thermionic converters is described. Topics include thermionic converter plasma studies, low temperature converter development, component hardware development, and combustion-heated thermionic device. Basic surface experiments, tripole converter experiments, design of cylindrical converter, and high efficiency conversion experiments are described. DOE

N80-20874# Sandia Corp., Albuquerque, N. Mex. Advanced Energy Projects Div.
MECHANICAL ENERGY STORAGE TECHNOLOGY DEVELOPMENT Annual Report, 1978 - 1979
Sep. 1979 31 p refs
(Contract EY-76-C-04-0789)
(SAND-79-1151) Avail: NTIS HC A03/MF A01

Program efforts to evolve components for flywheel energy storage systems are described. Components discussed include: commercial wheels, bearings, and vacuum technology. R.E.S.

N80-20875# Sandia Corp., Albuquerque, N. Mex. Fluid Mechanics and Heat Transfer Div.
NUMERICAL SIMULATION OF DUAL-MEDIA THERMAL ENERGY STORAGE SYSTEMS
Robert J. Gross, Charles E. Hickox, and Colin E. Hackett Aug. 1979 32 p refs
(Contract EY-76-C-04-0789)
(SAND-78-2282) Avail: NTIS HC A03/MF A01

A finite-difference, predictor-corrector, numerical technique is used to solve for fluid and solid temperature distributions in one dimensional flow through a finite length packed bed. The method allows for temperature dependent properties, time varying inlet conditions and nonuniform initial conditions. Computed results agree with the classical Schumann model to within 1% in simulations which exhibit thermal gradients as large as 310 C/m. Additional examples illustrate the attractive characteristics of the method, namely its accuracy, flexibility, ease of implementation, and computational efficiency. DOE

N80-20876# Burns and McDonnell, Kansas City, Mo.
FEASIBILITY OF COGENERATION APPLICATION OF A 4.8 MW FUEL CELL POWER PLANT AT A SANTA CLARA, CALIFORNIA PAPER MILL Final Report
D. E. Criner Jul. 1979 300 p refs
(Contract ET-78-C-03-2189)
(SAN-2189-T1; Rept-78-805-4-005) Avail: NTIS HC A13/MF A01

The feasibility of employing a 4.8-MW fuel cell power plant in a cogeneration mode was evaluated. Ways for utilizing the waste heat from the fuel cell within the paper mill were studied. Several uses were identified which would reduce the amount of process steam now generated by conventional fossil fuel boilers in the paper mill. The electrical energy from the fuel cell could be fed to the municipal electric system or could be used directly by the paper mill, depending upon the form of ownership for the fuel cell. Economic analyses were performed for several scenarios involving different fuels and ownership arrangements. Breakeven capital costs for the fuel cell power plant were computed for the various scenarios. Sensitivity studies were performed to determine the impact of variations in assumed base values for fuel price, electric rates, and other parameters. The environmental implications of the fuel cell power plant were also assessed. DOE

N80-20877# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
ENERGY EFFICIENT BUILDINGS PROGRAM Annual Report
Aug. 1979 68 p refs
(Contract W-7405-eng-48)
(LBL-9576; EEB-79-5) Avail: NTIS HC A04/MF A01

Experimental and theoretical research into energy use in buildings, and the analysis of energy conservation strategies and measures are outlined. Topics discussed include: (1) building envelopes program; (2) ventilation program; (3) indoor air quality - gas stove emissions; (4) DOE-1 computer program for building energy analysis; (5) schools program; (6) hospitals program; (7) energy efficient windows program; (8) energy efficient lighting program; and (9) passive systems analysis and design. DOE

N80-20878# Argonne National Lab., Ill. Energy and Environmental Systems Div.
PROJECTIONS OF DIRECT ENERGY CONSUMPTION BY MODE: THE 1975 - 2000 BASELINE
Rita E. Knorr and Marianne Miller Aug. 1979 139 p refs
(Contract W-31-109-eng-38)
(ANL/CNSV-4) Avail: NTIS HC A07/MF A01

A comprehensive set of activity and energy-demand projections are presented for each of the major transportation modes and submodes. Projections were developed for a business-as-usual case which provides a benchmark for assessing the impact of potential conservation strategies. This baseline case assumes a continuation of present trends and no new energy-conserving programs beyond currently mandated fuel economy stands. However, because of anticipated changes in personal vehicle fuel economy, fuel prices, modal shifts, and a lower than historic rate of economic growth, projected growth rates in transportation activity and energy consumption depart from historic patterns. The factors responsible for this departure are discussed. The assumption and methodologies used to develop the modal projections are described and the projections are discussed with other efforts. DOE

N80-20879# Illinois Univ., Chicago. Dept. of Energy Engineering.
THERMAL FLUID SELECTION FOR LONG-DISTANCE HEAT TRANSMISSION
S. Szepe and J. M. Calm 1979 8 p refs Presented at the 14th Intersoc. Energy Conversion Conf., Boston, 5 Aug. 1979 Prepared in cooperation with Argonne National Lab., Ill.
(Contract W-31-109-eng-38)
(CONF-790803-47) Avail: NTIS HC A02/MF A01

A model for evaluating fluids for long distance thermal energy transport is presented. The model uses power function approximations for physical and economical relations, and its simplified version provides analytical insights into the optimal allocation of major cost components as well as a solution for the total transmission cost. The model was used to develop a criterion for screening candidate liquids for long distance thermal energy transport. The criterion derived is dependent on the physical properties and unit costs of the candidate fluids, and on the transport requirements. It can be used for fast screening and ranking of a great number of fluids. This approach may save considerable effort by eliminating the need for detailed engineering, economic, environmental, and safety studies on those fluids which would ultimately prove economically undesirable. Representative fluids are discussed and compared with the reference case of transmission by hot water. DOE

N80-20880# Dubin-Bloome Associates, New York.
HEAT-PUMP-CENTERED INTEGRATED COMMUNITY ENERGY SYSTEMS: SYSTEM DEVELOPMENT Final Report
Fred S. Dubin, Paul Herzog, and Amos Halfon Aug. 1979 450 p refs
(Contract W-31-109-eng-38)
(ANL/CNSV-TM-8) Avail: NTIS HC A19/MF A01

The performance of heat-pump centered integrated community energy systems (HP-ICES) is reported for two case studies, one in Washington, D.C. and the other in Boston, Massachusetts. The ice-generating HP-ICES uses the heat of fusion of water as a heat source for the heat pump, thus converting the water into ice. The ice is sorted in a bin and used the following summer for cooling, which, therefore, could be considered a byproduct of heating. The annual source energy input and the return on investment is cited for each project. The life cycle annual average cost and annual average operating and administration cost for the HP-ICES is given in comparison to corresponding quantities and costs of a conventional central system with equal heating and cooling capacity. DOE

N80-20881# Technical Information Center, Oak Ridge, Tenn.
ENERGY INFORMATION DATA BASE Report, Feb. 1978 - Sep. 1979
Sep. 1979 124 p refs Supplement to TID-4579-R10
(DOE/TIC-4579-R10-Suppl-6) Avail: NTIS HC A06/MF A01

Changes and additions to TID-4579-R10 (the authority list for serial titles) are presented. The supplement is cumulative from February 1978. DOE

N80-20882# Midwest Research Inst., Golden, Colo.
CONVERSION SYSTEM OVERVIEW ASSESSMENT. VOLUME 1: SOLAR THERMOELECTRICS
T. S. Jayadev, J. Henderson, J. Finegold, and D. Benson Aug. 1979 214 p refs
(Contract EG-77-C-01-4042)
(SERI/TR-35-078-Vol-1) Avail: NTIS HC A10/MF A01

An assessment of thermoelectrics for solar energy conversion is given. There is significant potential for solar thermoelectrics in solar technologies where collector costs are low; e.g., Ocean Thermal Energy Conversion and solar ponds. Reports of two studies by manufacturers assessing the cost of thermoelectric generators in large scale production are included and several new concepts thermoelectric systems are presented. DOE

N80-20883# Midwest Research Inst., Golden, Colo.
WIND ENERGY INFORMATION DIRECTORY
Oct. 1979 30 p refs
(Contract EG-77-C-01-4042)
(SERI/SP-69-290) Avail: NTIS HC A03/MF A01

Wind Energy Information was prepared to provide researchers, designers, manufacturers, distributors, dealers, and users of wind energy conversion systems, with easy access to technical information. This directory lists organizations and publications which have the main objective of promoting the use of wind energy conversion systems, some organizations that can respond to requests for information on wind energy or make referrals to other sources of information, and some publications that occasionally include information on wind energy. DOE

N80-20884# Physical Sciences, Inc., Woburn, Mass.
PERFORMANCE MODEL FOR MOLTEN CARBONATE FUEL CELLS Final Report, 5 Jul. 1978 - 5 Jul. 1979
G. Wilemski, T. Wolf, D. Bloomfield, M. L. Finson, E. R. Pugh, and K. L. Wray Aug. 1979 171 p refs
(Contract ET-78-C-03-2083)
(TR-190) Avail: NTIS HC A08/MF A01

The development of a performance model for molten carbonate fuel cells is reported. Key physical and chemical phenomena modeled include mass transport, ohmic losses, electrode kinetics, fuel and oxidant utilization, gas phase convective heat transfer and in-plane heat conduction through cell hardware. Numerical schemes were developed and programmed to calculate overpotential versus current density curves for individual electrodes, current-voltage performance curves for entire cells, the cell current density distribution, and the cell temperature distribution. Agreement between model predictions and available experimental data for isothermal electrode and cell performance ranges from good to excellent. Predictions of nonisothermal cell performance are also presented and discussed. DOE

N80-20885# Energy and Environmental Analysis, Inc., Arlington, Va.
INDUSTRIAL SECTOR TECHNOLOGY USE MODEL (ISTUM): *INDUSTRIAL ENERGY USE IN THE UNITED STATES, 1974 - 2000. VOLUME 2:* RESULTS Final Report
Oct. 1979 117 p
(Contract EX-76-C-01-2344)
(DOE/FE-2344/2) Avail: NTIS HC A06/MF A01

The results of the initial base-case run of ISTUM are presented in four sections: (1) introduction; (2) projected trends in industrial fuel consumption; (3) projected contributions of technologies to the industrial sector (fossil, conservation, solar, geothermal, coal direct heat cogeneration, conventional technologies); and (4) service sector perspectives of ISTUM base-case results (steam sector, intermediate and dirty direct heat, coal-capable indirect heat, machine-drive service sector, electrolyte sector, space heat, not coal-capable indirect heat, calcining, glass melting, brick and clay firing, iron making, steel reheating). DOE

N80-20886# Brookhaven National Lab., Upton, N. Y.
HYDROGEN STORAGE FOR AUTOMOBILES
G. Strickland 1979 4 p refs Presented at the DOE Chem. Energy Storage and Hydrogen Energy Systems Contracts Rev. Meeting, Reston, Va., 12 Nov. 1979
(Contract EY-76-C-02-0016)
(BNL-28906; CONF-791127-5) Avail: NTIS HC A02/MF A01

An analysis of hydrogen-fueled automobiles is presented. The hydrogen is stored either as a metal hydride at moderate pressure in TiFe-Mn-H/sub x/ and at low pressure in MgH/sub x/ catalyzed with 10 wt % Ni, or it is stored in hollow glass microspheres at pressures up to about 400 atm. Each system is briefly described. The results of the vehicle analysis are compared with those for the conventional automobile and with electric vehicles powered by Pb-acid or Ni-Zn batteries. Comparisons are made on the basis of automobile weight, initial user cost, and life-cycle cost. The results are limited to those for the 5-passenger vehicle in the period 1985-1990, and are provided as probable and optimistic values. DOE

N80-20887# Colorado State Univ., Fort Collins. Solar Energy Applications Lab.
RESIDENTIAL SOLAR HEATING AND COOLING USING EVACUATED TUBE SOLAR COLLECTORS: CSU SOLAR HOUSE 3 Final Report, 1 Feb. 1976 - 30 Sep. 1978
D. S. Ward, J. C. Ward, and H. S. Oberoi Mar. 1979 119 p refs
(Contract EY-76-S-02-2858)
(COO-2858-24-Summ) Avail: NTIS HC A06/MF A01

A residential solar heating and cooling system utilizing an array of evacuated tube solar collectors was evaluated. The evacuated tube collectors were removed and replaced with a state of the art liquid-heating flat plate solar collector array. The installation, performance, and operating experience of the evacuated tube solar collector integrated with the CSU Solar House 3 residential sized solar heating and cooling system was examined. DOE

N80-20888# General Atomic Co., San Diego, Calif.
INSTALLATION AND STARTUP OF THE FIXED MIRROR SOLAR CONCENTRATOR COLLECTOR FIELD SUBSYSTEM Final Report, 31 Jan. 1977 - 31 Mar. 1979
G. H. Eggers Jun. 1979 111 p refs
(Contract EY-76-C-04-0789)
(GA-A-15344; SAND-79-7015) Avail: NTIS HC A06/MF A01

The design, fabrication, installation, and startup of the fixed mirror solar concentrator is described. The total system cost was $773 per m squared. The system cost projection for a commercial plant is $188.73 per m squared. At design conditions, with the oil inlet temperature at 245 C and the oil outlet temperature at 316 C, the peak system efficiency at noon was 36.8%. DOE

N80-20889# Woodard-Clyde Consultants, San Francisco, Calif. Fossil Fuel and Advanced Systems Div.
ENVIRONMENTAL ASSESSMENT METHODOLOGY: SOLAR *POWER PLANT APPLICATIONS. VOLUME 3. ENVIRONMENTAL IMPACT ASSESSMENT APPLICATION* Final Report
K. Nair and A. Sicherman May 1979 112 p refs
(EPRI Proj. 551)
(EPRI-ER-1070-Vol-3) Avail: NTIS HC A06/MF A01

The environmental impact assessment methodology described in another volume is applied to a problem of site selection for solar thermal power plants. Environmental impact assessment of selected solar-thermal sites are compared. Certain potential impacts of solar-thermal and wind energy central systems are examined. In appendix A a data base system that was used to organize the literature on selected data base sites is described. Appendix B contains detailed calculations and preliminary data used in the environmental impact assessment. Appendix C presents a discussion of generic attributes for measuring biological impacts. Appendix D is a selected bibliography of general references dealing with environmental impacts of solar-thermal and wind energy central systems. DOE

N80-20890# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
EVALUATION OF A SULFUR OXIDE CHEMICAL HEAT STORAGE PROCESS FOR A STEAM SOLAR ELECTRIC PLANT
Joshua Dayan, Scott Lynn, and Alan Foss Jul. 1979 198 p refs Revised
(Contract W-7405-eng-48)
(LBL-7868-Rev) Avail: NTIS HC A09/MF A01

A technically feasible process configuration was developed for the sulfur oxide system, 2 SO3 reversible 2 SO2 + O2 in energy storage. Complete material and energy balances are presented for a base case that represents a middle range of expected operating conditions. Equipment sizes and costs were estimated for the base case to obtain an approximate value for the cost of the electricity that would be produced from such an installation. In addition, the sensitivity of the efficiency of the system to variations in design and operating conditions was determined for the most important parameters and design details. The overall efficiency of converting heat into electricity is about 26%. DOE

N80-20891# Sandia Labs., Albuquerque, N. Mex.
DARRIEUS VERTICAL AXIS WIND TURBINE PROGRAM OVERVIEW
Richard H. Braasch 1979 15 p refs Presented at the 4th Biennial Conf. and Workshop on Wind Energy Conversion Systems, Washington, D.C., 28 Oct. 1979
(Contracts EY-76-C-04-0789; DE-AC04-76DP00789)
(SAND-79-2146C; CONF-791097-1) Avail: NTIS HC A02/MF A01

Some of the more salient recent developments in the Darrieus vertical axis wind turbine technology are presented. First generation costs and future plans are discussed. Potential design improvements are presented along with their cost benefits. Aerodynamic structural, and system analyses capabilities were developed to support and evaluate the system design. DOE

N80-20892# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
WIND ENERGY SYSTEMS Quarterly Review, 1 Jul. - 30 Sep. 1979
Dec. 1979 176 p
(Contract EG-77-C-01-4042)
(SERI/PR-351-480) Avail: NTIS HC A09/MF A01

An overview of the wind energy systems (WES) program is presented. The objectives, accomplishments, activities, and outputs of each of the tasks in the WES program are described. DOE

N80-20893# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
OPTICAL ANALYSIS AND OPTIMIZATION OF LINE FOCUS COLLECTORS
P. Bendt, A. Rabl, H. W. Gaul, and K. A. Reed Sep. 1979 73 p refs
(Contract EG-77-C-01-4042)
(SERI/TR-34-092) Avail: NTIS HC A04/MF A01

A macroscopic approach to the optical analysis of a solar concentrator is described. The method yields all the parameters needed for the optical design of line focus parabolic troughs. The flux at the receiver is determined as a function of concentrator along with receiver size, width of Sun, and optical errors. All causes of image spreading are quantified as angular standard deviation. Ray tracing with a real reflector and a real Sun is shown to be equivalent to convoluting the angular acceptance function of a perfect concentrator with an effective radiation source. This effective source, in turn, is obtained by convoluting the distribution function of optical errors with the angular profile of the Sun. The problem is reduced to two dimensions by projecting the three dimensional motion of the Sun on the plane normal to the tracking axis. In this frame the apparent width of the Sun increases with incidence angle. A formula and a simple graphical procedure are provided for finding the optimal geometric concentration ratio, maximizing net power output. The results are illustrated by specific examples. DOE

N80-20894# TRW, Inc., McLean, Va. Energy Systems Group.
THERMAL ENERGY STORAGE APPLICATION AREAS
Mar. 1979 105 p
(Contract EC-77-C-01-5113)
(CONS/5113-T4) Avail: NTIS HC A06/MF A01

The use of thermal energy storage in the areas of building heating and cooling, recovery of industrial process and waste heat, solar power generation, and off-peak storage and load management in electric utilities is reviewed. DOE

N80-20895# Center for Legislative Improvement, Denver, Colo.
ENERGY SOURCE BOOK
Dewitt John and Davey Klearman Aug. 1979 167 p
(Contract EW-78-X-48-0409)
(DOE/TIC-10190) Avail: NTIS HC A08/MF A01

Data are compiled on energy sources for the Rocky Mountain Region. The National Energy Act, major Federal energy legislation, and the state energy legislation, 1974-1979, are covered. Energy consumption and conservation are discussed with the aid of charts and statistics. Topics discussed include potential for energy conservation in the Mountain-Plain States; potential energy savings from Weatherization; residential energy conservation programs; and thermal efficiency standards for new buildings; energy reserves and production by state: oil, gas, coal, and uranium; potential for energy production from renewable and non-conventional sources; oil refining capacity; pipelines and movement of petroleum; electrical generation; water requirements for energy production; and severance taxes in the Mountain-Plain States. Information sources and a glossary are provided. DOE

N80-20896# Brookhaven National Lab., Upton, N. Y.
PERFORMANCE OF HEAT PUMPS AT ELEVATED EVAPORATING TEMPERATURES WITH APPLICATION TO SOLAR INPUT
E. A. Kush 1979 9 p refs Presented at the ASME Ann. Meeting, New York, 3-7 Dec. 1979
(BNL-26772; CONF-791205-15) Avail: NTIS HC A02/MF A01

The performance of the heat pump component in the solar-assisted heat pump (SAHP) system was investigated under conditions attendant to series solar input. Theoretical predictions, results of systematic experiments run on a special heat pump simulator, and interpretation/analysis of how high coefficients of performance heat pumps can be used in installed SAHP systems are presented. DOE

N80-20897# Los Alamos Scientific Lab., N. Mex.
THE 1-GWh DIURNAL LOAD-LEVELING SUPERCONDUCTING MAGNETIC ENERGY STORAGE SYSTEM REFERENCE DESIGN. APPENDIX C: DEWAR AND STRUCTURAL SUPPORT
J. G. Bennett and F. D. Ju Sep. 1979 56 p refs
(Contract W-7405-eng-36)
(LA-7885-MS-Vol-6) Avail: NTIS HC A04/MF A01

The mechanical aspects of the dewar to contain a 1-GWh superconducting coil in a 1.8 K helium bath are discussed along with the means for supporting the coil and dewar against the rock of an underground excavation. DOE

N80-20898# Oak Ridge National Lab., Tenn.
PERSPECTIVE ON WORLD ENERGY
Truman D. Anderson 25 Sep. 1979 25 p
(Contract W-7405-eng-26)
(DOE/TIC-10273) Avail: NTIS HC A02/MF A01

The problems associated with a rapidly increasing world population in the midst of fixed land resources are addressed. The unconventional resources of oil, gas, and uranium are compared in terms of abundance to conventional reserves. Nuclear fission energy is evaluated for its capability of solely supporting the world energy demands. DOE

N80-20899# Spectrolab, Inc., Sylmar, Calif.
DESIGN AND FABRICATION OF PROTOTYPE COMBINED PHOTOVOLTAIC/THERMAL NON-TRACKING COLLECTOR
H. Jandorf, L. Flourswetz, and F. M. Schwartz Jun. 1979 56 p
(Contract EY-76-C-04-0789)
(SAND-79-7014) Avail: NTIS HC A04/MF A01

Work performed to design, fabricate, test and analyze future production costs of a combined photovoltaic/thermal collector is summarized. Design improvement recommendations and future applications of the combined collector are considered. DOE

N80-20900# Wisconsin Univ. - Madison.
INTERFEROMETRIC STUDY OF THE NATURAL CONVECTION CHARACTERISTICS OF FLAT PLATE, SLAT AND VEE-CORRUGATED SOLAR COLLECTORS Final Report
M. M. ElWakil and J. W. Mitchell 30 Jun. 1979 7 p
(Contract EY-76-S-02-2971)
(COO-2971-6) Avail: NTIS HC A02/MF A01

The natural convection heat transfer relations for the heat transfer between absorber and cover plates of solar collectors were studied. Interferometric techniques were employed to evaluate the local coefficients. Average values were obtained by integration of the local values. The results are presented in terms of correlations between Nusselt number and Grashof number. The investigations were carried out over tilt angles of 45 to 90 degrees. The Grashof number range tested was representative of that existing in flat plate collectors. The various geometrics included large flat enclosures, small aspect ratio enclosures representative of honeycomb or slat collectors, vee-corrugated

(vee-grooved) collectors, and compound parabolic concentrators.
DOE

N80-20901# California Univ., Berkeley. Lawrence Berkeley Lab.
METHODOLOGY FOR EVALUATING PHYSICAL CONSTRAINTS ON RESIDENTIAL SOLAR ENERGY USE
P. L. Smith and S. T. McCreary 1979 73 p refs
(Contract W-7405-eng-48)
(UCRL-15001) Avail: NTIS HC A04/MF A01

A procedure is set forth for assessing physical constraints on solar energy use at the site scale and for computerized findings as a data base for analysis at the community, sub-community, and individual parcel scales. Background information regarding the development of the project is presented. Next, the solar technologies being considered, their requirements for optimal performance, and physical constraints on the achievement of those requirements are described. This theoretical discussion is followed by a description of its application to a case study community. A discussion of the types of analyses in which the computerized data can be used is followed by a discussion of the way in which these analyses can be used at various points in governmental and private planning and decision-making processes.
DOE

N80-20902# Mitre Corp., McLean, Va.
STATUS OF THE DOE BATTERY AND ELECTROCHEMICAL TECHNOLOGY PROGRAM
R. Roberts Sep. 1979 177 p refs
(Contract ET-78-C-01-3295)
(MTR-8026) Avail: NTIS HC A09/MF A01

Research on electrochemical storage systems is reviewed with emphasis on secondary batteries. Batteries in the research, development, and demonstration phases include nickel/iron, lithium/metal sulfide, zinc/chloride, metal/air, and hydrogen/chlorine. Supporting research on the morphology of active materials and cell performance is also reviewed. Potential contributions of the battery program to electric vehicles, photovoltaic systems, distributed electrical systems, and industrial energy conservation are discussed.
K.L.

N80-20903# Battelle Pacific Northwest Labs., Richland, Wash.
ECONOMICS OF THERMAL ENERGY STORAGE FOR COMPRESSED AIR ENERGY STORAGE SYSTEMS
S. C. Schulte Aug. 1979 8 p refs
(Contract EY-76-C-06-1830)
(PNL-SA-7949) Avail: NTIS HC A02/MF A01

The costs of compressed air energy storage (CAES) systems utilizing thermal energy storage are compared with the costs of conventional CAES systems and combustion gas turbine systems. Comparisons are made on the basis of system energy cost levelized over system operating lifetime (mills/kWh). Two principal conclusions resulted from the study. First, given today's fuel prices and the expected fuel prices in the 1980's, conventional CAES systems yield lower energy cost estimates than combustion gas turbine systems. Second, thermal energy system storage/adiabatic CAES systems yield equivalent and, in some instances, slightly lower energy cost estimates than conventional CAES systems while requiring considerably less turbine fuel oil.
DOE

N80-20904# Battelle Pacific Northwest Labs., Richland, Wash.
ECONOMICS OF COMPRESSED AIR ENERGY STORAGE EMPLOYING THERMAL ENERGY STORAGE
S. C. Schulte and R. W. Reilly Nov. 1979 34 p refs
(Contract EY-76-C-06-1830)
(PNL-3191) Avail: NTIS HC A03/MF A01

System design and capital cost estimates are adopted from three independent studies to arrive at a series of levelized energy costs over a system's lifetime. In addition, some analyses are provided to gauge the sensitivity of these levelized energy costs to fuel and compression energy costs and to system capacity factors. The systems chosen for comparison are conventional CAES, hybrid CAES, adiabatic CAES, and an advanced-design gas turbine. In conventional CAES systems the heat of compression generated during the storage operation is rejected to the environment, and later, during the energy generation phase, turbine fuel must be burned to reheat the compressed air. In the hybrid systems some of the heat of compression is stored and reapplied later during the generation phase, thereby reducing turbine fuel requirements. The adiabatic systems store adequate thermal energy to eliminate the need for turbine fuel entirely. The gas turbine is included within the report for comparison purposes.
DOE

N80-20906# Department of Energy, Washington, D. C.
BIOMASS ENERGY SYSTEMS: ENVIRONMENTAL READINESS DOCUMENT
Sep. 1979 50 p
(DOE/ERD-0021) Avail: NTIS HC A03/MF A01

A number of environmental and socio-economic impacts of biomass energy systems are identified. The large land and water requirements for terrestrial biomass energy production might lead to socio-economic conflicts. It might also lead to an increase in potential for air and water erosion of the soil. Severe ecosystems impacts would result from disturbing 100 million acres of marginal farm land and 350 million acres of forest land. Removal of residues could increase nutrient removal and reduce the amount of organic matter returning to the soil and limit future biomass production. Air pollution from the direct combustion of biomass must be considered. The systems of ethanol with stillage is dependent on the feedstock. The energy costs to purify the ethanol and pollution control costs appear to prevent economical production of ethanol in the near term.
DOE

N80-20906# Poly Solar, Inc., Garland, Tex.
LOW COST THIN FILM POLYCRYSTALLINE SILICON SOLAR CELLS Quarterly Report, 15 Mar. - 30 Jun. 1979
J. D. Crownover and G. A. VanderLeeden Jul. 1979 20 p refs
(Contract DE-AC03-79ET-23048)
(DOE/ET-23048/1; QR-1) Avail: NTIS HC A02/MF A01

Major efforts during this period were directed to the organization and planning of the overall technical approaches, particularly in regard to the preparation of metallurgical silicon substrates. The zone-melting technique was selected for the preparation of substrates, and a moving-coil zone-melting apparatus was designed and constructed. A chemical vapor deposition apparatus for the deposition of the active region of solar cell was also designed and constructed. In addition, the purification of metallurgical silicon by acid-extraction was investigated semi-quantitatively.
DOE

N80-20907# Oak Ridge Associated Universities, Tenn. Inst. for Energy Analysis.
LIMITS TO ENERGY MODELING
A. M. Weinberg Sep. 1979 19 p refs
(Contract EY-76-C-05-0033)
(ORAU-IEA-79-16(0)) Avail: NTIS HC A02/MF A01

The limitations of energy modeling are described. Possible approaches to energy policy that avoid the necessity of depending on uncertain predictions are discussed.
R.E.S.

N80-20908# Stanford Univ., Calif. Dept. of Operations Research.
DETERMINING THE FEASIBILITY OF INCORPORATING WATER RESOURCE CONSTRAINTS INTO ENERGY MODELS Final Report
N. Buras Aug. 1979 132 p refs Sponsored by Elec. Power Res. Inst.
(EPRI-EA-1147) Avail: NTIS HC A07/MF A01

The availability of regional water resources for energy related activities is discussed in terms of the feasibility of integrating these availabilities into energy models. Following reviews of water resources data bases, of technologies involved in energy development, and of energy models with regional disaggregation, two models are used for the study of this integration: the Regional Energy System Optimization Model (RESOM), and the Energy Policy Model (EPM). Water resources constraints are introduced in these models, and exploratory computer runs using demonstration scenarios are made. The test scenarios assumed that nonenergy users would make increasing demands upon regional water resources, leaving limited amounts of increasingly more expensive water for energy activities. The results of the exploratory runs demonstrate the feasibility of

integrating water resources availabilities and water consumption data into energy-economy models. DOE

N80-20909*# Paragon Pacific, Inc., El Segundo, Calif.
WIND ENERGY SYSTEM TIME-DOMAIN (WEST) ANALYZERS USING HYBRID SIMULATION TECHNIQUES Final Report
John A. Hoffman Oct. 1979 30 p refs Prepared for NASA and DOE
(Contracts DEN3-26)
(NASA-CR-159737; PPI-1030-6; DOE/NASA/0026-79/1) Avail: NTIS HC A03/MF A01 CSCL 10B

Two stand-alone analyzers constructed for real time simulation of the complex dynamic characteristics of horizontal-axis wind energy systems are described. Mathematical models for an aeroelastic rotor, including nonlinear aerodynamic and elastic loads, are implemented with high speed digital and analog circuitry. Models for elastic supports, a power train, a control system, and a rotor gimbal system are also included. Limited correlation efforts show good comparisons between results produced by the analyzers and results produced by a large digital simulation. The digital simulation results correlate well with test data. K.L.

N80-20910# National Technical Information Service, Springfield, Va.
SOLAR WATER PUMPS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Nov. 1979
Audrey S. Hundemann Dec. 1979 71 p Supersedes NTIS/PS-78/1288; NTIS/PS-77/1161
(PB80-802531; NTIS/PS-78/1288; NTIS/PS-77/1161) Avail: NTIS HC $30.00/MF $30.00 CSCL 02C

Design concepts and the technical and economic feasibility of using solar energy to pump water are discussed in abstracts from worldwide literature. Topic areas cover the use of solar heat actuated Rankine cycle engines and free cylinder Stirling engines for solar powered water pumps, pumps driven by photovoltaic modules, and application of solar pumps to irrigation and electric power generation. This updated bibliography contains 85 abstracts, 25 of which are new entries to the previous edition. GRA

N80-20911# General Accounting Office, Washington, D. C. Energy and Minerals Div.
HOW TO BURN COAL EFFICIENTLY AND ECONOMICALLY, AND MEET AIR POLLUTION REQUIREMENTS: THE FLUIDIZED-BED COMBUSTION PROCESS
9 Nov. 1979 56 p
(PB80-107501; EMD-80-12) Avail: NTIS HC A04/MF A01 CSCL 13B

The Department of Energy's program to demonstrate fluidized bed coal combustion are presented as well as ways the program could be improved. It specifically recommends that the Secretary of Energy: (1) enter into an interagency agreement with the Department of Defense to place industrial demonstration plants in Defense industrial facilities; and (2) enter into an interagency agreement with the Tennessee Valley Authority for hosting the 200-megawatt utility demonstration plant. The questionable need and utility of a component test and integration unit are discussed and options for terminating the contractor and selling or modifying the facility for other uses are suggested. GRA

N80-20912# Cedar Associates, Evanston, Ill.
SNOW AND ICE ACCUMULATION AT SOLAR COLLECTOR INSTALLATIONS IN THE CHICAGO METROPOLITAN AREA Final Report
Ross B. Corotis, Charles H. Dowding, and Edwin C. Rossow Aug. 1979 109 p Sponsored in part by DOE, Washington, D.C.
(PB80-113749; NBS-GCR-79-181) Avail: NTIS HC A06/MF A01 CSCL 10A

Observations and data concerning snow and ice on eighteen flat plate solar collector installations in the Chicago area are presented. The data were collected in February and March of 1979, following a record snowfall in January. Nearly all of the installations were on the roofs of buildings, and about half were mounted flush with the roof. The remainder were mounted on racks at an angle to the roof. Sketches and photographs of the buildings and snow accumulation, weather data for the entire winter, and comments of the owners are included, as well as a technique for the extraction of linear measurements from the photographs. GRA

N80-20913# New Mexico Univ., Albuquerque. Dept. of Physics.
SOLAR PONDS FOR RESIDENTIAL HEATING, HEAT EXTRACTION FROM A SALT GRADIENT SOLAR POND Final Report, 19 Aug. 1976 - 30 Jun. 1977
F. Zangrando and H. C. Bryant Jul. 1979 41 p refs Sponsored in part by New Mexico Energy and Minerals Dept., Santa Fe
(PB80-108624; NMEI-45) Avail: NTIS HC A03/MF A01 CSCL 10A

A salt gradient solar pond is an efficient, low cost solar energy collection and long range storage system for low temperature heat. Research efforts to establish operational parameters, selection criteria for the materials to be used, cost and performance are described. The physical behavior of doubly diffusive systems exposed to the environment was also studied. GRA

N80-20914# New Mexico Energy Inst., Las Cruces. Mechanical Engineering Dept.
AN ECONOMICAL SOLAR HEATED AND COOLED RESIDENCE FOR SOUTHERN NEW MEXICO Final Report, 1 Sep. 1976 - 31 Aug. 1979
Thomas R. Mancini and Phillip R. Smith Jul. 1979 51 p refs
(PB80-108616; NMEI-16) Avail: NTIS HC A04/MF A01 CSCL 13A

The construction and performance of 'Skytherm' solar heated and cooled passive house located on the campus of New Mexico State University in Las Cruces, New Mexico are described. GRA

N80-20915# National Zoological Park, Washington, D.C.
NATIONAL SOLAR HEATING AND COOLING PROGRAMS
Aug. 1979 64 p refs Presented at the Intern. Solar Energy Society Congress, Atlanta, 28 May - 1 Jun. 1979
(Contract DE-AC01-79CS-30108)
(PB80-104987; CCMS-109) Avail: NTIS HC A04/MF A01 CSCL 13A

Status reports on the national solar heating and cooling programs of seventeen countries participating in the Committee on the Challenges of Modern Society's Solar Energy Pilot Study are presented. R.E.S.

N80-20916# Bureau of Reclamation, Denver, Colo. Electric Power Branch.
DEVELOPMENT AND EVALUATION OF A MODEL DOUBLY-FED MACHINE
F. R. Schleif Sep. 1979 75 p refs
(PB80-100662) Avail: NTIS HC A04/MF A01 CSCL 09C

The design and development of a model doubly-fed machine system was studied and evaluated for potential application on two generators and the pump/generating units of pump-storage projects. It was found that this problem of instability can be overcome. The machine has a wide variety of capabilities which are indicated to presently practical for exploitation to satisfy special needs such as adjustable speed, rapid synchronizing ability, system damping, or superior frequency control of an isolated system. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N80-20917 California Inst. of Tech., Pasadena.
ATMOSPHERIC TRANSPORT OF ACIDITY IN SOUTHERN CALIFORNIA BY WET AND DRY MECHANISMS Ph.D. Thesis
Howard Michael Liljestrand 1980 179 p
Avail: Univ. Microfilms Order No. 8006281

Acid precipitation samples were analyzed to determine acid and base composition. The concentrations of major cations and anions as well as trace weak acids were determined. The chemical

composition of the precipitation samples collected were modeled in several ways: (1) chemical balances to determine the contributions of sea salt, soil dust, stationary sources, mobile sources, and nonpoint sources of ammonia; (2) multiple regression analysis to relate ground level measurements of air quality and atmospheric conditions with rainwater nitrite plus nitrate and sulfate concentrations; and (3) gas-liquid equilibrium models.
Dissert. Abstr.

N80-20918 Marquette Univ., Milwaukee, Wis.
TRACE CHARACTERIZATION OF METALS IN SOLID SAMPLES AND AIR POLLUTANTS Ph.D. Thesis
Horng-Yih Wei 1978 159 p
Avail: Univ. Microfilms Order No. 8006562

A method for direct characterization of trace metals in solid samples is described. Solid samplers were first ground to powders and mixed with graphite powder followed by direct non-flame spectrophotometry. Several experimental parameters were studied for the determination of lead, cadmium and silver in rock samples via atomizers. Two novel methods are also described for the determination of lead pollutants in air. Subliter samples of air drawn through 6.4 mm diameter porous graphite disk were analyzed by either (1) direct non-flame atomization or (2) by a technique involving electrodeposition onto a tungsten coil which is subsequently used as an atomizer. Analytical results achieved on atmospheric samples by both of these methods are shown to agree well with results achieved using conventional methods.
Dissert. Abstr.

N80-20919 Arizona Univ., Tucson.
POLLUTANT FORMATION IN FLAT LAMINAR OPPOSED JET DIFFUSION FLAMES Ph.D. Thesis
Werner Artur Hahn 1979 206 p
Avail: Univ. Microfilms Order No. 8006739

It is shown that the opposed jet diffusion flame has one useful attribute that distinguishes it from all other diffusion flames. This feature is the one-dimensionality of the flame with respect to temperature, concentration, and axial (but, clearly, not radial) velocity profiles. This is shown by first applying a similarity transform on the radial velocity, converting the partial differential equations to ordinary differential equations and then numerically solving the momentum, energy, and species balance equations in a fully coupled manner. The numerical, variable mesh algorithm required for the solution of the resulting large set of very stiff, boundary valued, ordinary differential equations is presented. The model then allows determination of the correct velocity boundary conditions such that the flame is (mathematically) flat and one-dimensional.
Dissert. Abstr.

N80-20920*# National Aeronautics and Space Administration, Washington, D. C.
A GLOBAL BIOGEOCENOTICAL BIOSPHERE SIMULATION
N. N. Moiseyev Mar. 1980 12 p refs Transl. into ENGLISH from Biogeofiz. i Mate. Metody Issled. Geosistem (Moscow), 1978 p 37-49 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(NASA-TM-76042) Avail: NTIS HC A02/MF A01 CSCL 13B

This model of the D. Forrester type, constructed in differential equations, predicts the food and mineral supply for the factors biosphere population, depending on two socio-economic factors, until about the year 2500. If contemporary rates of natural resources utilization are maintained and there is no management of the environment, food resources will begin to limit human population growth after 2200, and mineral resources will after 2300. A decrease in the biosphere pollution, increase in effective agricultural production, and discovery of new energy sources may forestall or completely avert the onset of a crisis situation. Conservation measures, according to the model, are to a considerable extent realizable only if carried out simultaneously in both areas.
Author

N80-20921# Department of Energy, Washington, D. C.
ENVIRONMENTAL DEVELOPMENT PLAN: COAL EXTRACTION AND PREPARATION
Sep. 1979 98 p refs
(DOE/EDP-0050) Avail: NTIS HC A05/MF A01

The environmental strategy to be used by DOE to resolve environmental concerns associated with coal extraction and preparation will be to: (1) schedule environmental research in coordination with the development of the technology through its research, development and demonstration phases; (2) identify what environmental research is already underway; (3) provide for an Environmental Coordination Committee to ensure that the appropriate research is conducted in a timely manner; (4) schedule compliance activities, such as National Environmental Policy Act (NEPA) documents and Environmental Readiness Documents (ERD's) at appropriate times in the RD and D cycle; and (5) develop a monitoring approach to track the compliance of each technology with applicable Federal, State and local standards and with the performance goals established for that technology. The initial evaluation of the coal extraction and preparation program indicates that the demonstrations of technologies in the program will be undertaken within existing industrial mining/preparation facilities and therefore will not present significant identifiable impacts. Project-specific Environmental Assessment or Impact Statements will be made on a project specific basis. Even so, assessments must be made prior to the employment of program elements.
DOE

N80-20922# Department of Energy, Washington, D. C.
ENVIRONMENTAL DEVELOPMENT PLAN FOR SPACE APPLICATIONS
Sep. 1979 83 p refs
(DOE/EDP-0057) Avail: NTIS HC A05/MF A01

The planning and management requirements and schedules needed to evaluate and assess the environmental, health, and safety aspects of the Space Applications Program are identified. Environment is defined in its broadest sense to include environmental, health (occupational and public), safety, socioeconomic, legal, and institutional aspects. Topics considered include: (1) space nuclear power system nuclear fuel fabrication; (2) space nuclear power system heat source fabrication; (3) testing of subsystems and assembled systems; (4) research and development in support of space nuclear system development; (5) nuclear system responses to launch and reentry accidents; and (6) nuclear system environmental behavior and recovery.
DOE

N80-20923# Los Alamos Scientific Lab., N. Mex. Health Div.
PROTOTYPE PARTICULATE STACK SAMPLERS WITH SINGLE-CUT NOZZLE AND MICROCOMPUTER CALCULATING/DISPLAY SYSTEM
John C. Elder, Larry G. Littlefield, and Marvin I. Tillery 1979 20 p refs Presented at the Symp. on Advances in Particulate Sampling and Measurement, Daytona Beach, Fla., 7 Oct. 1979
(Contract W-7405-eng-36)
(LA-UR-79-2421; CONF-791018-1) Avail: NTIS HC A02/MF A01

A prototype particulate stack sampler (PPSS) was developed to improve on the existing EPA method five sampling apparatus. Its primary features are (1) higher sampling rate (56 1/min); (2) display (on demand) of all required variables and calculated values by a microcomputer-based calculating and display system; (3) continuous stack gas moisture determination; (4) a virtual impactor nozzle with 3 mu mass median diameter cutpoint which collects fine and coarse particle fractions on separate glass fiber filters; (5) a variable-area inlet to maintain isokinetic sampling conditions; and (6) conversion to stainless steel components from the glass specified by EPA method five.
DOE

N80-20924# Pennsylvania State Univ., University Park. Dept. of Electrical Engineering.
DESIGN OF DATA ACQUISITION AND CONTROL SYSTEMS FOR ENVIRONMENTAL MONITORING AND MICROCLIMATE CONTROL M.S. Thesis
Daniel Paul Fuoco May 1979 83 p refs
(Contract EC-77-S-02-4397)
(COO-4397-T3) Avail: NTIS HC A05/MF A01

The automation and optimization of fruit production are discussed. The equipment that was developed are described as well as a brief methodology that considers how this equipment came to be.
DOE

N80-20925# California Univ., Livermore. Lawrence Livermore Lab. Environmental Instrumentation Group.
SURVEY OF INSTRUMENTATION FOR ENVIRONMENTAL MONITORING: MAJOR UPDATE. VOLUME 3: RADIATION
Sep. 1979 448 p
(Contract W-7405-eng-48)
(LBL-1-Vol-3) Avail: NTIS HC A19/MF A01

A comprehensive survey of instrumentation for environmental monitoring is presented. Consideration is given to instruments and techniques and to those developed for other purposes but having possible applications to radiation monitoring. The results of the survey are given as descriptions of the physical and operating characteristics of available instruments, critical comparisons among instrumentation methods, and recommendations of promising methodology and development of new instrumentation. Information is also given regarding the pollutants to be monitored, their characteristics and forms, their sources and pathways, their effects on the ecosystem, and the means of controlling them through process and regulatory controls. DOE

N80-20926# Woodard-Clyde Consultants, San Francisco, Calif.
ENVIRONMENTAL ASSESSMENT METHODOLOGY: SOLAR POWER PLANT APPLICATIONS. VOLUME 1. ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY Final Report
K. Nair and A. Sicherman May 1979 161 p refs
(EPRI Proj. 551)
(EPRI-ER-1070-Vol-1) Avail: NTIS HC A08/MF A01

A methodology for environmental impact assessment of solar power stations based on decision analysis is presented. A general overview of the methodology is given including a discussion of the issues warranting a formal analysis, the advantages of decision analysis from the decision maker's perspective, and some case study examples where the methodology was applied. The step-by-step implementation procedure for performing an environmental impact assessment using the methodology is described. The manner in which the methodology can incorporate cost into the analysis, both as a concern and as a yardstick of comparison, is discussed. Decision analysis and cost-benefit analysis are compared and contrasted. The appendix includes a bibliography concerning methods used by industry and/or government to make monetary estimates of environmental impacts. DOE

N80-20927# Oregon State Univ., Corvallis. Dept. of Atmospheric Science.
THEORETICAL ANALYSIS OF PERTURBATION SOLUTIONS TO THE PROBLEM OF INERTIAL CAPTURE OF AEROSOL PARTICLES Interim Report
S. C. Yoon Jul. 1979 34 p refs
(Contract EY-76-S-06-2227)
(RLO-2227-727-7) Avail: NTIS HC A03/MF A01

Perturbation solutions are sought to the problem of inertial capture of aerosol particles. An exact solution is obtained for the particle velocity along the axis of symmetry. The exact solution suggests that the perturbation solution is extremely accurate for all Stokes numbers except those very near the critical Stokes number. Also, under certain boundary conditions, the exact solution shows that inertial capture can occur even for particle with Stokes numbers less than the critical Stokes number. A computer extension technique is examined for the analysis and improvement of the perturbation series. DOE

N80-20928# Battelle Pacific Northwest Labs., Richland, Wash.
COMPREHENSIVE STUDY OF DRIFT FROM MECHANICAL DRAFT COOLING TOWERS Final Report
N. S. Laulainen, R. O. Webb (Environmental Systems Corp., Knoxville, Tenn.), K. R. Wilber (Environmental Systems Corp., Knoxville, Tenn.), and S. L. Ulanski (James Madison Univ., Harrisonburg, Va.) Sep. 1979 233 p refs
(Contract EY-76-C-06-1830)
(PNL-3083) Avail: NTIS HC A11/MF A01

Drift from mechanical draft cooling towers was studied by the simultaneous measurement of cooling tower source emission parameters meteorological variables, and drift deposition patterns during seven of eight test runs. Results from six of these test runs are presented and discussed. Substantial variation in drift emissions were noticed. Large day-to-day variations for a given cell and large cell-to-cell variations were observed. Meteorological conditions during the drift study were characterized by relatively high winds, warm temperatures and moderate humidities. The relatively high winds increased the uncertainty in the measured deposition patterns. In spite of the large (factor of 2 or 3) uncertainty in the measured deposition rates, preliminary calculations of drift deposition rates are in agreement with each other for test run 1. DOE

N80-20929# Energy and Environmental Analysis, Inc., Arlington, Va.
ADEQUACY ANALYSIS OF AIR QUALITY MONITORING ACTIVITIES RELEVANT TO CALIFORNIA THERMAL ENHANCED OIL RECOVERY FIELDS
Judy Matthews and J. Thomasian Nov. 1979 139 p refs
(Contract ET-78-C-01-3092)
(SAN-12093-1) Avail: NTIS HC A07/MF A01

A summary of enchanced oil recovery (EOR) activities in California is presented. Ambient air monitoring requirements are discussed in terms of state and Federal regulations. In addition, ambient air quality monitoring in California is considered with emphasis on specific monitoring requirements for new source regulation. An inventory of California EOR air quality monitoring activity is given and the adequacy of the air monitoring activity in the California EOR fields is discussed. DOE

N80-20930# Brookhaven National Lab., Upton, N. Y.
COAL-CONVERSION TECHNOLOGIES: SOME HEALTH AND ENVIRONMENTAL EFFECTS
S. C. Morris, P. D. Moskowitz, W. A. Sevian, S. Silberstein, and L. D. Hamilton Feb. 1979 27 p refs
(Contract EY-76-C-02-0016)
(BNL-5103; TID-4500) Avail: NTIS HC A03/MF A01

Selected health and environmental concerns of four coal conversion and four existing technologies are compared. Quantitative occupational health and safety estimates are presented covering extraction, transportation, distribution, processing, and conversion activities; also included are estimates of public health damage arising from fuel transportation and air pollution impacts. Qualitative estimates of health damage due to polycyclic organic matter and reduced sulfur are discussed. In general, energy inefficiencies, residuals, and implied environmental and health damages increase as follows: (1) direct combustion of natural gas and oil; (2) direct combustion of synthetic gas and oil; (3) central station electric power from synthetic gas; (4) central station electric power from coal; and (5) central station electric power from combustion of synthetic liquid fuels. Compliance and conflict of these technologies with Clean Air Act Amendments and other legislation are discussed. DOE

N80-20931# Water Research Centre, Stevenage (England).
[STUDIES OF WATER, 1978-1979] Annual Report
1979 32 p refs
Avail: NTIS HC A03/MF A01

Studies on water and health, wastewater treatment, water oriented economic problems, and environmental protection and monitoring are reported. The health effects of trace constituents in drinking water are discussed. Effluent quality and possibilities for its improvement are mentioned. The use of better methods and improved instrumentation in relation to environmental protection matters is discussed. Author (ESA)

N80-20932# Municipal Environmental Research Lab., Edison, N. J. Wastewater Research Div.
BIODEGRADATION AND TREATABILITY OF SPECIFIC POLLUTANTS Final Report
Edwin F. Barth and Robert L. Bunch Oct. 1979 69 p refs
(PB80-106438; EPA-600/9-79-034) Avail: NTIS HC A04/MF A01 CSCL 13B

Laboratory studies of the fate and effects of organics and metals in biological wastewater treatment processes are considered. The relationships between analytical control tests and biodegradation test methods are discussed. Various laboratory apparatuses for both continuous flow and static biodegradation methods are described. Both aerobic and anaerobic test results are included in the report. GRA

N80-20933# Research Triangle Inst., Research Triangle Park, N. C.
INTERPRETATION OF ENVIRONMENTAL ASSESSMENT DATA Final Report, Mar. 1978 - Sep. 1979
N. H. Sexton, F. W. Sexton, L. I. Sutherland, and T. D. Hartwell Sep. 1979 242 p refs
(Contract EPA-68-02-2156)
(PB80-108160; EPA-600/7-79-226) Avail: NTIS HC A11/MF A01 CSCL 13B

The preliminary attempts to formulate viable models for interpreting environmental assessment data are reported. The models are evaluated using data from the four most comprehensive environmental assessments. A format for entering environmental assessment results on FORTRAN computer sheets is presented and more complete data entry sheets are discussed. Various previously proposed models (source severity; source assessment models SAM/I, SAM/IA, and SAM/IB) are investigated using the data from the four previously mentioned studies. Correlations between biotests and chemical results, and between biotests, were calculated using the data from these four studies; a summary of possible correlations is presented. GRA

N80-20934# SRI International Corp., Menlo Park, Calif.
STRUCTURE REACTIVITY CORRELATIONS FOR ENVIRONMENTAL REACTIONS Final Report, 1 Apr. - 15 Aug. 1979
Theodore Mill Sep. 1979 66 p refs
(Contract EPA-68-01-4109)
(PB80-110323; EPA-560/11-79-012) Avail: NTIS HC A04/MF A01 CSCL 07D

Many of the key rate constants needed to predict rates of transformation and transport of organic chemicals in water and air can be estimated from structure reactivity correlations (SRC) with reasonable accuracy. These rate constants can be coupled with environmental parameters such as pH or oxidant concentrations to provide estimates of rates of these processes under a variety of environmental conditions. An example is shown of the use of SRC methodology to estimate rate and equilibrium constants for a specific chemical. GRA

N80-20935# Science Applications, Inc., Pleasanton, Calif.
SYSTEMATIC SENSITIVITY ANALYSIS OF AIR QUALITY SIMULATION MODELS Final Report, Jan. - Dec. 1978
Robert J. Gardinas and J. Peter Vajk May 1979 107 p refs
(Contract EPA-68-02-2942)
(PB80-112162; EPA-600/4-79-035) Avail: NTIS HC A06/MF A01 CSCL 13B

Systematic sensitivity and uncertainty analysis methods are reviewed and assessed for applications to air quality simulation models. Basic variables, mathematical foundations, user motivations and preferences, computer implementation properties, and costs (including both human and computer resources) are presented. Both deterministic and sampling methods are evaluated. Deterministic methods include the time-and user-honored method of arbitrary parameter adjustments by trial and error, variational methods, and by Green's function method (for kinetics systems only). Sampling methods include Monte Carlo sampling of the outputs of air quality models to compute variances and a Fourier analysis method of sampling model outputs to compute expectation values of sensitivity coefficients. GRA

N80-20936# Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Environmental Planning.
APPLICATION OF GERMANIUM DETECTORS TO ENVIRONMENTAL MONITORING
Dale W. Nix, Robert P. Powers, and Larry G. Kanipe Mar. 1979 131 p refs
(PB80-113624; TVA/EP-79/06; EPA-600/7-79-054) Avail: NTIS HC A07/MF A01 CSCL 13D

The problems involved in applying germanium defectors to the analysis of environmental samples are discussed. All aspects of germanium spectroscopy equipment, system installation, quality control, energy and efficiency calibration, spectral analysis, analytical sensitivities, and cost considerations are surveyed. GRA

N80-20937# Brower Electronics Lab., Raleigh, N.C.
BETA GAUGE OPERATION MANUAL Final Report, Aug. 1976 - May 1979
Joe Seibert and Tom Sager Aug. 1979 38 p
(Contract EPA-68-02-2431)
(PB80-112337; EPA-600/2-79-167) Avail: NTIS HC A03/MF A01 CSCL 13B

Complete beta gauge operating instructions for Federal test cycles are included as well as set up and calibration procedures. A trouble shooting guide provides instructions for locating problems. GRA

N80-20938# Air Pollution Technology, Inc., San Diego, Calif.
DEVELOPMENT OF SUPERIOR ENTRAINMENT SEPARATORS Final Report, Oct. 1976 - Mar. 1979
Seymour Calvert and Harry F. Barbarika Aug. 1979 163 p refs
(Contract EPA-68-02-218y)
(PB80-112394; EPA-600/7-79-180) Avail: NTIS HC A08/MF A01 CSCL 13B

A design for entrainment separators for scrubbers was developed. The problems of separation efficiency suspended solids deposition, and plugging of the entrainment separator were of primary concern. A pilot scale entrainment separator (ES) coupled to a scrubber and designed to handle a nominal gas flow rate of 1.4 cu m/s (3,000 ACFM) was designed, built and tested. The effect of ES performance on particulate emissions of a typical fossil fueled boiler was evaluated. The experimental program included measurements of entrainment size distribution and loading, entrainment collection efficiency, solids deposition character and rate, and ES washing efficiency. Results were compared with available models and criteria for effective washing were developed. GRA

N80-20939# National Marine Fisheries Service, Galveston, Tex. Environmental Research Div.
ENVIRONMENTAL ASSESSMENT OF AN ACTIVE OIL FIELD IN THE NORTHWESTERN GULF OF MEXICO, 1977 - 1978. VOLUME 3: CHEMICAL AND PHYSICAL INVESTIGATIONS Annual Report, 1977 - 1978
William B. Jackson, ed. Sep. 1979 722 p refs
(Contract EPA-IAG-DS-E693)
(PB80-107899; NOAA-79092004) Avail: NTIS HC A99/MF A01 CSCL 13B

The results of chemical and physical investigations of the operating Buccaneer oil field off Galveston, Texas are presented. The tasks completed include: (1) identifying alterations in the marine ecosystem due to the development of an oil field; (2) determining the pathways and bioaccumulation of heavy metals and selected nonmetal discharge constituents; (3) describing seasonal circulation patterns in the oil field; and (4) constructing a hydrocarbon model. K.L.

N80-20940# Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE MINERAL MINING AND PROCESSING POINT SOURCE CATEGORY Final Report
Douglas M. Costle, Thomas C. Jorling, Swep T. Davis, Robert B. Schaffer, and Ronald G. Kirby Jul. 1979 468 p refs
(PB80-110299; EPA-440/1-76-059B) Avail: NTIS HC A21/MF A01 CSCL 13B

The mineral mining and processing industry was studied in order to develop guidelines for existing point sources and standards of performance and pretreatment standards for additional sources. Supporting data and rationale for development of the effluent limitations guidelines and standards of performance are presented. GRA

N80-20941# Environmental Protection Agency, Ann Arbor, Mich. Technology Assessment and Evaluation Branch.
EVALUATION OF EXHAUST COLLECTION CONFIGURATION ON DIESEL PARTICULATE MEASUREMENT
Thomas Penninga May 1979 12 p
(PB80-104995; TAEB-79-8) HC A02/MF A01 CSCL 13B

Five different configurations of exhaust collection hardware were tested on a 1975 Mercedes Benz 300D and a 1979 Oldsmobile 350 CID Diesel. The average results for each configuration were compared to a baseline particulate emission number for each vehicle. A direct correlation was found between collection configurations and mass particulate emissions. GRA

N80-20942# Kerr (Robert S.) Water Research Center, Ada, Okla. Source Management Branch.
INDICATORY FATE STUDY Final Report, May 1978 - Feb. 1979
L. H. Myers, Thomas E. Short, Jr., Bill L. DePrater, Fred M. Pfeffer, Donald H. Kampbell, and John E. Matthews Washington, D.C. EPA Aug. 1979 105 p
(PB80-102809; EPA-600/2-79-175) Avail: NTIS HC A06/MF A01 CSCL 13B

The media disposition of specific priority pollutants are addressed. Composite samples were obtained from the influent, effluent, residuals, and air from 12 industrial biological treatment systems. These samples were extracted and analyzed by gas chromatography for organic constituents, by atomic absorption for metals, and by EPA methodology for phenolics, cyanide, and mercury. Participating industries included: (1) organics and plastics; (2) pharmaceuticals; (3) pesticides; (4) rubber; (5) wood preservative; and (6) petroleum refining. GRA

N80-20943# Argonne National Lab., Ill. Energy and Environmental Systems Div.
DEVELOPMENT OF AN EXAMPLE CONTROL STRATEGY FOR LEAD
Albert E. Smith, Marshall R. Monarch, Byung S. Cho, and Danna M. Hediger Apr. 1979 125 p refs
(PB80-123029; EPA-450/2-79-002; AQPS-1.2-123) Avail: NTIS HC A06/MF A01 CSCL 13B

A methodology for the development of a control strategy conforming with the requirements for lead implementation plans found in Part 51 of Title 40 of the Code of Federal Regulations is presented in guideline form. A ficticious three-county area is used to illustrate some of the quantitative and qualitative procedures employed in developing the control strategy. The guideline covers the following topics: development of baseline emission inventory and air quality data; projection and allocation of emissions; application of models and analysis of modeling results; and the testing, evaluation, and selection of available strategies. GRA

N80-20944# Little (Arthur D.), Inc., Cambridge, Mass.
FURTHER CHARACTERIZATION OF SORBENTS FOR ENVIRONMENTAL SAMPLING Final Report, Mar. 1978 - Jun. 1979
J. F. Piecewicz, J. C. Harris, and P. L. Levins Sep. 1979 47 p refs
(Contract EPA-68-02-2150)
(PB80-118763; EPA-600/7-79-216) Avail: NTIS HC A03/MF A01 CSCL 13B

Results are given of an experimental program to evaluate the breakthrough characteristics of sorbent resins for sampling of organic vapors using an elution analysis chromatographic technique. The effects of water vapor and CO2, at levels typical of gaseous effluents from combustion processes, on retention of nonpolar and polar species on two commonly used sorbents (XAD-2 and Tenex-GC) were studied. Effects on XAD-2 were small but the volumetric capacity of Tenex-GC was substantially decreased. Other sorbents were characterized for potential use in vapor sampling systems coconut-based charcoal, petroleum-based charcoal, silica gel, Ambersorb XE-340 and Xe-347, and XED-B. Other significant results are reported. GRA

N80-20945# Environmental Protection Agency, Ann Arbor, Mich. Standards Development and Support Branch.
LIGHT-DUTY DIESEL GASEOUS EMISSIONS MEASUREMENT - COMPARISON OF DILUTION TUNNEL TEST RESULTS TO CERTIFICATION CELL TEST RESULTS
Jeff Alson Jan. 1979 13 p
(PB80-115991; SDSB-79/04) Avail: NTIS HC A02/MF A01 CSCL 13B

Gaseous emissions data are summarized for eleven light-duty diesel vehicles using both the standard certification test procedure and the dilution tunnel test procedure which incorporates particulate measurement. The greatest variability was found in the HC variability inherent in measuring HC and, in the extreme cases, also to equipment inconsistencies between the test cells. CO, NOx and CO2 data from the dilution tunnel test procedure were generally in good agreement with the certification data with the only trend being slightly lower NOx and CO2 values from the dilution tunnel. This is hypothesized as a possible dynamometer effect. It is concluded that there are no significant differences in the two test procedures with regards to the measurement of gaseous emissions. GRA

N80-20946# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
USER'S GUIDE FOR NUMERICAL MODELING OF BUOYANT PLUMES IN A TURBULENT, STRATIFIED ATMOSPHERE
Ralph G. Bennett and Michael W. Golay Feb. 1979 228 p refs Sponsored by Consolidated Edison Co., N. Y. and Northeast Utilities Service Co., Hartford, Conn.
(PB80-114549; MIT-EL-79-004) Avail: NTIS HC A11/MF A01 CSCL 13B

A widely applicable computational model of buoyant, bent-over plumes in realistic atmospheres is developed. A three-dimensional picture of a steady state plume is constructed from a sequence of time-dependent, two-dimensional plume cross sections-each cross section of the sequence is spaced progressively further downwind as it is advected for a progressively longer time by the prevailing wind. The buoyancy sources in the plume include the sensible heat in the plume, the latent heat absorbed or released in plume moisture processes, and the heating of the plume by a radioactive pollutant in the plume. Atmospheric variables are allowed to be functions of height, and the ambient atmospheric turbulence is included in the simulations. GRA

N80-20947# PEDCo-Environmental, Inc., Durham, N.C.
THE IMPACT OF FUTURE DIESEL EMISSIONS ON THE AIR QUALITY OF LARGE CITIES Final Report
Roy A. Paul May 1979 228 p refs
(Contract EPA-68-02-2585)
(PB80-113657; EPA-450/5-79-005) Avail: NTIS HC A11/MF A01 CSCL 13B

The impact of diesel-powered vehicles in the central business districts of New York, Chicago and Los Angeles was studied. Annual particulate matter emissions from automobiles, taxis, buses and light-duty trucks were projected to the year 2000. The emissions were correlated with air monitoring data in order to calculate the impact on air quality. Significant increases were predicted in atmospheric particulate matter because of increased diesel engines. GRA

N80-20948# Mitre Corp., McLean, Va. Metrek Div.
ASSESSMENT OF THE IMPACT OF RESOURCE RECOVERY ON THE ENVIRONMENT Final Report
Judith G. Gordon Aug. 1979 147 p refs
(Contract EPA-68-03-2596)
(PB80-102874; EPA-600/8-79-011) Avail: NTIS HC A07/MF A01 CSCL 13B

The environmental effects of municipal solid waste disposal in 1990 and the changes in these effects resulting from implementation of resource recovery from municipal solid waste are assessed. The direct effects of municipal solid waste disposal as well as the secondary effects of substituting materials recovered from municipal solid waste for raw materials in the production of steel, aluminum, glass, and energy are considered. Energy conservation resulting from use of recovered scrap in materials production and energy production by recovery of energy from municipal solid waste is also evaluated. The analysis is based on specific scenarios for municipal solid waste disposal in 1990 without and with implementation of resource recovery. GRA

N80-20949# Land-Air, Inc., Holloman, N. Mex. Applied Research Div.
CONTROL TECHNOLOGIES FOR PARTICULATE AND TAR EMISSIONS FROM COAL CONVERTERS
C. Chen, C. Koralek, and L. Breitstein Jul. 1979 115 p refs
(Contract EPA-68-02-2601)
(PB80-108392; EPA-600/7-79-170) Avail: NTIS HC A06/MF A01 CSCL 13B

Solid and tar particulate emissions in raw product gases from several types of coal gasifiers are characterized in terms of their total quantities, chemical composition, and size distribution. Control technologies for particulate emissions were assessed with respect to the limitations of the control device and to existing and proposed regulations. Fabric filters were not suitable

where tar particulates were found or at higher than 300 C. Electrostatic precipitators operated as high as 1100 C. Rotary cyclones showed the widest range of applicability, but conventional cyclones were most economical for particles larger than 50 microns. Solid and tar particulate emissions collected for 250,000 scfd of a medium-Btu gas contained up to 1.6 million kg of particulate. GRA

N80-20950# Land-Air, Inc., Holloman, N. Mex. Applied Research Div.
HOT GAS CLEANUP PROCESS Final Report, Jan. 1977 - Mar. 1979
A. Bekir Onursal Jul. 1979 155 p refs
(Contract EPA-68-02-2601)
(PB80-108467; EPA-600/7-79-169) Avail: NTIS
HC A08/MF A01 CSCL 13B

The results of a study to identify and classify 22 hot gas cleanup (HGC) processes for desulfurizing reducing gases at above 430 C according to absorbent type into groups employing solid, molten salt, and molten metal absorbents are presented. Each process is described in terms of its status, chemistry, operating characteristics, problems, and uncertainties. The applicability of non HGC processes to a variety of coal gasification systems for several end uses for the product gases is assessed. Advantages and disadvantages of HGC relative to conventional low temperature cleanup systems with respect to thermal efficiency, the presence and/or emissions of tars, particulates, and NOx, and corrosion are described. GRA

N80-20951# Vanderbilt Univ., Nashville, Tenn. Center for Environmental Quality Management.
DEVELOPMENT OF A BIOLOGICAL SIMULATION MONITOR FOR JOINT MUNICIPAL/INDUSTRIAL TREATMENT SYSTEMS Final Report, 1 Jun. 1975 - 31 May 1977
Ann N. Clarks, W. Wesley Eckenfelder, and John A. Roth Aug. 1979 173 p refs
(Grant EPA-R-803740)
(PB80-111032; EPA-600/2-79-180) Avail: NTIS
HC A08/MF A01 CSCL 14B

Hardware for wastewater source causing chronic or acute inefficiency in the performance of a joint biological treatment facility was evaluated. Bench and pilot scale bio-treatment studies of selected industrial wastes at various loadings were performed. Several monitoring techniques were applied to the treatment systems, and the parameters identified in pretreatment guidelines were monitored as measures of removal efficiencies. GRA

N80-20952# New Mexico Univ., Albuquerque. Technology Application Center.
REMOTE SENSING APPLIED TO POLLUTION MONITORING. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1976 - Jun. 1979
Gerald F. Zollars Jul. 1979 51 p Sponsored in part by NTIS, Springfield, Va.
(NTIS/PS-79/0732/2) Avail: NTIS HC $28.00/MF $28.00 CSCL 13B

Articles are cited from the international literature concerning the use of remote sensors to aid in the monitoring of air and water pollution. Use of lasers, optical radar systems, aerial photography, and satellite observations are included. (Contains 194 citations). GRA

N80-20953# NATO Committee on the Challenges of Modern Society, Brussels (Belgium).
GUIDELINES TO THE AIR QUALITY MANAGEMENT SYSTEMS, REVISED
Apr. 1979 167 p refs Revised
(PB80-109978; NATO/CCMS-71-Rev) Avail: NTIS
HC A08/MF A01 CSCL 13B

Several air quality management systems in NATO countries are described with emphasis on the formulation of strategy plans. Major strategy plan options, criteria for the selection of control strategies, surveillance technique, possible interactions with other environmental media and the necessity for revision of strategy plans are discussed. GRA

N80-20954# KLD Associates, Inc., Huntington, N. Y.
DEVELOPMENT OF DROPLET SIZING FOR THE SCRUBBING SYSTEMS Final Report
Hector Medecki, K. C. Wu, and D. E. Magnus Research Triangle Park, N. C. EPA Jul. 1979 124 p refs Sponsored in part by Ind. Environ. Res. Lab.
(Contract EPA-68-02-2111)
(PB80-108574; EPA-600/7-79-166) Avail: NTIS
HC A06/MF A01 CSCL 14B

The development and characteristics of the DC-2 Droplet Counter as used to evaluate scrubbing systems are described. The measurement of entrained droplets and their concentrations in gas streams is important in pollution control technology. The use of a hot-wire sensor can successfully measure the desired parameters for droplets in the size range from 1 to 500 micrometers. Extensive testing in the laboratory are described a comparison with results from the Brink impactor is given. A correlation of results for these two measurement techniques was achieved. Field tests at four different sites are also described. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N80-20955 Adelphi Univ., Garden City, N. Y.
A STUDY OF MAGNETOGRAVITY WAVES Ph.D. Thesis
Meyer Bouscher 1980 92 p
Avail: Univ. Microfilms Order No. 8006397

The geometry of magnetogravity wave surfaces in an incompressible, isothermal, inviscid, nonrotating, flat, horizontally stratified perfectly conducting atmosphere was studied in order to verify that such waves may contribute heavily to the heating of the upper solar atmosphere. The equations of the wave surface were determined from those of the wave normal surface using the envelope construction. The locations of the cuspidal edges were determined for vertical, horizontal, and oblique magnetic fields. In addition, a line of self-intersection was found along the directions of the horizontal and oblique fields. The existence of the line of self-intersection suggests that magnetogravity waves, at least those of high enough frequency, can carry energy upward along the solar magnetic field, thus lending support to Lighthill's conjecture. Dissert. Abstr.

N80-20956 Wisconsin Univ. - Madison.
PRECIPITATION AND ACCUMULATION ESTIMATES FOR EAST ANTARCTICA, DERIVED FROM RAWINSONDE INFORMATION Ph.D. Thesis
David Howard Bromwich 1979 156 p
Avail: Univ. Microfilms Order No. 8004706

A rigorous analysis of the rawinsonde data from 9 coastal stations and one on the plateau is given. A special attempt is made to resolve the key boundary layer properties. A systematic and important bias in the record due to missed observations during storms is demonstrated. Estimates for these missing values which are obtained from multilinear regression equations increase the computed annual poleward water vapor transport at two stations by more than 30 percent. Other significant observations are reported. Dissert. Abstr.

N80-20957 Stanford Univ., Calif.
CRYSTALLIZATION AND METASOMATISM OF THE CUCHILLO MOUNTAIN LACCOLITH, SIERRA COUNTY, NEW MEXICO Ph.D. Thesis
David Kent McMillan 1979 298 p
Avail: Univ. Microfilms Order No. 8006330

The Cuchillo Mountain laccolith, of early Tertiary age, is a hypabyssal, quasiconcordant mass of porphyritic monzonite enclosed by carbonate strata of Pennsylvanian age. It is comagmatic with a thick sequence of propylitized volcanic rocks that are extensively exposed in adjacent areas. Rocks of the laccolith were pervasively propylitically altered, with a principal change from andesine monzonite porphyry to albite porphyry.

Pre-emplacement crystallization is represented by a phenocryst assemblage that comprises minerals observed in chilled margins other than as groundmass. Post-emplacement crystallization is represented by groundmass consisting of microlitic alkali feldspar hosted by quartz, and an assemblage of micarolitic products that are not present in the chilled margins. Large-scale redistribution of constituents, chiefly the major alkalies, is reflected by increasing intensities of albitization, epidotization, chloritization, and iron oxidation from the margins toward the interior of the intrusion, and by apparently complementary potassium enrichment near the margins. Dissert. Abstr.

N80-20958 Oregon State Univ., Corvallis.
STRONTIUM ISOTOPIC AND TRACE ELEMENT GEOCHEMISTRY OF THE SADDLE MOUNTAINS AND GRANDE RONDE BASALTS OF THE COLUMBIA RIVER BASALT GROUP Ph.D. Thesis
Dennis Oliver Nelson 1980 234 p
Avail: Univ. Microfilms Order No. 8007125

Variations in trace element and Sr isotopic compositions in the Columbia River Basalt (CRB) are discussed. These compositions reflect complex and variable origins for the CRB magmas. Among the most varied is the Saddle Mountains Basalt (SMB) in which Sr ratios vary from 0.7078 to 0.7147 + or - 0.002. The higher ratios reflect contamination through consistent correlations with major element compositions. Age and field relations suggest that the contaminated flowrocks are not the result of progressive contamination of a single magma, but rather reflect the contamination of independent magmas during this ascent. The Pomona and Elephant Mountain Basalts (SMB) reflect mantle values. These basalts erupted from the Chief Joseph dike swarm along with the Grande Ronde (GRB) and Wanapum Basalts. Together, the GRB and SMB indicate a mantle source with Sr ratios varying from 0.7043 to 0.7081. Dissert. Abstr.

N80-20959 California Univ., San Diego.
MARINE GEOLOGY AND TECTONIC EVOLUTION OF THE NORTHWESTERN MARGIN OF THE CALIFORNIA CONTINENTAL BORDERLAND Ph.D. Thesis
James Keene Crouch 1979 116 p
Avail: Univ. Microfilms Order No. 8006883

The geology and history of the northwestern margin of the California continental borderland are examined using data from seismic-reflection profiling and bottom sampling. It is suggested that the northwestern margin of the borderland along with the western Transverse Ranges was rifted from an original tectonic setting off northern Baja California begining about 18 m.y. ago. During the rifting event, the Franciscan and Great Valley belts underlying the outer borderland were translated northwestward along a ridge-trench transform fault resulting in: (1) a repetition of these belts in the borderland off Southern California, and (2) clockwise rotation and subsequent thrusting of these belts (western Transverse Ranges) against the southern Coast Ranges. Dissert. Abstr.

N80-20960 Purdue Univ., Lafayette, Ind.
FINITE-DIFFERENCE SYNTHETIC SEISMOGRAMS FOR KINEMATIC MODELS OF THE EARTHQUAKE SOURCE Ph.D. Thesis
Juan Manuel Espindola 1979 162 p
Avail: Univ. Microfilms Order No. 8005867

The dynamic displacement field of kinematic dislocation in two dimensions is modeled by a finite-difference technique in skew coordinates. The scheme involves the solution of the heterogeneous, elastic vector wave equation subjected to dislocation conditions. Algorithms are included to model the free surface and absorbing artificial boundaries which simulate an infinite half-space. Specification of faults with arbitrary dip is implemented by means of the skew-coordinate system. Other source parameters such as time-history, slip-function, and rupture velocity are user selected. Near-field synthetic seismograms were calculated by this procedure for selected source parameters for two cases of geologic interest (i.e., buried basin and layer over a half space). These examples illustrate the influence of fault parameters and local geology on ground motion. Significant effects due to the heterogeneous media and various fault and source parameters suggest that the method can provide a new realistic modelling tool for the study of the interaction between the earthquake source and the local geology in the near-field for long period ground motion. Dissert. Abstr.

N80-20961 Stanford Univ., Calif.
A NON-GAUSSIAN STOCHASTIC MODEL APPLIED TO DECONVOLUTION AND SEISMOGRAM INVERSION Ph.D. Thesis
Robert John Godfrey 1979 97 p
Avail: Univ. Microfilms Order No. 8006313

An algorithm that iteratively removes the source waveform present in a suite of seismograms was developed and tested on real data. Assuming a non-Gaussian reflectivity model, both the color and phase effects of the source waveform were removable from the seismogram. The main ingredient in the algorithm is a zero memory (instantaneous) non-linear estimator of reflection coefficient amplitude. Forcing a filtered version of the seismogram to resemble these estimates was accomplished iteratively. An algorithm that converts a deconvolution into acoustic impedance is proposed. A feature of the algorithm is the ability to merge additional information, besides the deconvolution, into the computation of impedance. Dissert. Abstr.

N80-20962 Purdue Univ., Lafayette, Ind.
THE GENERATION OF SYNTHETIC SEISMOGRAMS FOR LATERALLY HETEROGENEOUS MODELS USING THE FINITE DIFFERENCE TECHNIQUE Ph.D. Thesis
Frederick Elwood Mazzella 1979 239 p
Avail: Univ. Microfilms Order No. 8005914

A method for the generation of synthetic seismograms for two-dimensional heterogeneous models specified only by P wave (dilatation) velocity is developed. Synthetic seismograms are calculated for seven heterogeneous (both vertical and horizontal) geologically realistic models. Each model is described graphically and is accompanied by a displacement seismogram record section for the vertical and horizontal components. These record sections reveal significant amplitude and time effects which result from the velocity structure. Dissert. Abstr.

N80-20963 Stanford Univ., Calif.
PRE-STACK PARTIAL MIGRATION Ph.D. Thesis
Ozdogan Yilmaz 1979 126 p
Avail: Univ. Microfilms Order No. 8006373

A procedure to improve conventional seismic data processing by removing the degrading effect of wide offsets on dipping events so that they stack coherently is proposed. The pre-stack partial migration provides the interpreter with a high quality common midpoint (CMP) stack section which can be subsequently migrated. The theory of pre-stack partial migration is based on the double square root equation, which describes seismic imaging with many shots and receivers. The double square root operator in common midpoint space can be approximately separated into two terms, one involving only migration effects and the other involving only moveout correction. This separation provides an analysis of conventional processing. Estimation of errors in the separation yields the equation for pre-stack partial migration. Dissert. Abstr.

N80-20964*# California Inst. of Tech., Pasadena. Seismological Lab.
HOTSPOTS AND THE EVOLUTION OF THE MANTLE
Don L. Anderson [1979] 33 p refs
(Grant NGL-05-002-069)
(NASA-CR-162906; Contrib-3432) Avail: NTIS HC A03/MF A01 CSCL 08G

Trace element patterns show that continental and ocean island basalts are complementary to mid-ocean ridge basalts (MORB). The relative sizes of the two source regions can be estimated from enrichment/depletion patterns. Their combined volume, computed from estimates of whole mantle abundances, occupies the entire upper mantle. The source regions appear to be the result of an early differentiation of the mantle. The MORB source evolved from the melt fraction which lost its late stage enriched fluids to the overlying plume source. The MORB source is primarily garnet and clinopyroxene, consistent with it being an eclogite cumulate. Author

N80-20965# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.

VALIDATION OF THE DAIRCHEM CODE 1: QUIET MIDLATITUDE CONDITIONS

Melvin G. Heaps and Joseph M. Heimerl Sep. 1979 42 p refs

(DA Proj. 1L1-61102-B-53A)

(AD-A077880; ERADCOM/ASL-TR-0041) Avail: NTIS HC A03/MF A01 CSCL 04/1

Two long-standing problems in the atmospheric sciences have been the correct modeling of the ion chemistry in the earth's atmosphere and the proper determination of the ion species and densities through in situ measurements. Comparison between experimental data and simulations of those data by computer modeling of atmospheric chemistry is a means of validating the computer code as well as indicating which processes are in need of further study. The DAIRCHEM computer code is used here to simulate data taken in the midlatitude D region during quiet conditions. Comparison between the total positive ion density profile derived from rocket measurements and the one computed by the code shows very good agreement in the 30 to 90 km range, with the exception that the simulated ion density profile is of somewhat smaller magnitude that the experimental one in the 60 and 75 km region. Such a discrepancy is only partially explained by the uncertainties in the ionization rate of NO due to Lyman alpha radiation. Comparison between the measured and the computed electron density profiles shows that the measured profile is consistently of a smaller magnitude that the computer profile in the 65 and 85 km range. GRA

N80-20968# Lamont-Doherty Geological Observatory, Palisades, N. Y.

OBSERVATIONS OF POSITION, OCEAN DEPTH, ICE ROTATION, MAGNETIC DECLINATION AND GRAVITY TAKEN AT THE FRAM 1 DRIFTING ICE STATION Progress Report, Mar. - May 1979

Kenneth Hunkins, Thomas Manley, and Werner Tiemann Sep. 1979 70 p refs

(Contract N00014-76-C-0004)

(AD-A077063; LDGO-CU-1-79; TR-1) Avail: NTIS HC A04/MF A01 CSCL 08/10

The Arctic Ocean north of Greenland is a relatively unexplored area. FRAM I was a research station established on drifting pack ice to carry out geological, geophysical, oceanographic and biological studies in this region. This report contains geophysical data collected at the FRAM I drifting station. These data include station positions determined by satellite navigation, echo soundings, ice floe azimuths, magnetic declination and gravity readings. GRA

N80-20967# Washington Univ., Seattle. Quaternary Research Center.

PERIGLACIAL RESEARCH Final Report, 10 Jan. 1972 - 30 Sep. 1979

Chester M. Burrous 31 Oct. 1979 13 p

(Grants DA-ARO(D)31-124-73-G42; DAAG29-76-G-0056)

(AD-A079280; ARO-10804-10; ARO-12913.9-GS) Avail: NTIS HC A02/MF A01 CSCL 08/13

The problems studied comprised various forms of frost action in soils, including deformation, upfreezing of objects, and slope movements during freezing and thawing; uplift of objects by ice surfaces during freezing; and determination of unfrozen water content of frozen soils. GRA

N80-20969# Naval Research Lab., Washington, D. C. Geophysical and Plasma Dynamics Branch.

PRELIMINARY REPORT OF NUMERICAL SIMULATIONS OF INTERMEDIATE WAVELENGTH ExB GRADIENT DRIFT INSTABILITY IN IONOSPHERIC PLASMA CLOUDS

M. J. Keskinen, S. L. Ossakow, and P. K. Chaturvedi (Berkeley Research Associates, Arlington, Va.) 26 Nov. 1979 24 p

(AD-A079313; NRL-MR-4116; AD-E000344) Avail: NTIS HC A02/MF A01 CSCL 04/1

Two dimensional numerical simulations of intermediate wavelength (100-1000m) ExB gradient-drift instability in local unstable regions of large F region ionospheric plasma clouds were performed, using an initial one dimensional (y), cloud geometry, for plasma cloud density gradient scale lengths L - 3, 6, 10 km. For conditions typical of 200 km barium releases, it was that linearly unstable modes saturated by nonlinear generation of linearly damped modes along the y direction (parallel to ExB drift). In the nonlinear regime, power laws are observed. These results are compared with recent in situ experimental measurements and theoretical predictions. R.E.S.

N80-20989# Naval Research Lab., Washington, D. C. Plasma Physics Div.

PRELIMINARY REPORT OF NUMERICAL SIMULATION OF INTERMEDIATE WAVELENGTH COLLISIONAL RAYLEIGH-TAYLOR INSTABILITY IN EQUATORIAL SPREAD F Interim Report

M. J. Keskinen and P. K. Chaturvedi (Berkeley Research Associates, Arlington, Va.) 7 Dec. 1979 26 p refs

(DNA Proj. NWET-I25AAXYX960; NRL Proj. H02-42; NRL Proj. A03-16)

(AD-A079307; AD-E000344; NRL-MR-4116) Avail: NTIS HC A03/MF A01 CSCL 04/1

Computer simulations of the intermediate wavelength (100 to 1000 m) collisional Rayleigh-Taylor instability were performed using parameters typical of the post-sunset bottomside (300 km) equatorial F region ionosphere. For ambient electron density gradient scale lengths L - 5, 10, 15 km it was found that the linearly unstable modes saturate by nonlinear generation of linearly damped vertical modes with the result that in the nonlinear regime, power laws are observed in the horizontal and vertical one-dimensional power spectra with n - 2 to 2.5. These results are consistent both with in situ experimental data and theoretical prediction. K.L.

N80-20970# Los Alamos Scientific Lab., N. Mex.

REVIEW OF IONOSPHERIC DISTURBANCES RESULTING FROM SOME NATURALLY OCCURRING EVENTS

M. M. Hoffman Nov. 1979 21 p refs

(Contract W-7405-eng-36)

(LA-7984-MS) Avail: NTIS HC A02/MF A01

Some known and some potential sources of atmospheric disturbances were investigated in a review of scientific papers selected to illustrate the roles of naturally occurring phenomena in generating observable ionospheric effects. Reports of acoustic and ionospheric effects resulting from the Alaskan earthquake of 1964 were used as a guide to the nature of signals generated by all seisms. Scaling these effects to smaller seisms is considered. Some models for enhanced acoustic coupling between the earth and atmosphere are discussed. Investigations of signals generated within the atmosphere by meteorological events are also reviewed. DOE

N80-20971# Colorado School of Mines, Golden. Evacuation Engineering and Earth Mechanics Inst.

DETERMINATION OF BASALT PHYSICAL AND THERMAL PROPERTIES AT VARYING TEMPERATURES, PRESSURES, AND MOISTURE CONTENTS Progress Report

R. J. Miller 31 Aug. 1979 82 p

(Contract EY-77-C-06-1030)

(RHO-BWI-C-55; PR-3) Avail: NTIS HC A05/MF A01

The rock mechanics testing performed for Rockwell Hanford Operations is summarized. Cores were supplied from drill hole DC-4 on the Hanford Site, characterized geologically, and tested for thermal and physical properties for designing long-term underground storage of radioactive waste materials. Uniaxial and triaxial results indicate strengths similar to drill hole DC-6, but significantly higher than drill hole DC-8. Trends with density, depth, confining pressure, and temperature, however, were similar for the three drill hole locations tested. DOE

N80-20972# Colorado School of Mines, Golden. Evacuation Engineering and Earth Mechanics Inst.

DETERMINATION OF BASALT PHYSICAL AND THERMAL PROPERTIES AT VARYING TEMPERATURES, PRESSURES, AND MOISTURE CONTENTS Progress Report

R. J. Miller 13 Aug. 1979 80 p

(Contract EY-77-C-06-1030)

(RHO-BWI-C-54; PR-2) Avail: NTIS HC A05/MF A01

The rock mechanics testing performed for Rockwell Hanford Operations is summarized. Cores were supplied from drill hole DC-8 on the Hanford Site, characterized geologically, and tested for thermal and physical properties for designing long-term underground storage of radioactive waste materials. Results

indicate significantly lower strengths for drill hole DC-8 than determined for drill hole DC-6 or for the drill holes reported on in the previous fiscal year tests. However, trends were found to be similar between drill holes DC-6 and DC-8. DOE

N80-20973# Battelle Columbus Labs., Ohio.
CHARACTERIZATION AND ANALYSIS OF DEVONIAN SHALES AS RELATED TO RELEASE OF GASEOUS HYDROCARBONS Quarterly Progress Report, Jan. - Mar. 1979
R. S. Kalyoncu, J. P. Boyer, and M. J. Snyder 15 Apr. 1979 240 p
(Contract EY-76-C-05-5205)
(ORO-5205-10) Avail: NTIS HC A11/MF A01

This program has the objective of determining the relationships between the shale characteristics, hydrocarbon gas contents, and well location, and thereby provide a sound basis for (1) assessing the productive capacity of the Eastern Devonian Gas Shale deposits and (2) guiding research, development, and demonstration projects to enhance the recovery of natural gas from the shale deposits. The Y-1 well in Allegany County, New York was sampled in September 1978. 412 samples were collected from the Allegany County, New York well. Characterization data on Y-1 (EGSP New York No. 1), Allegany County, New York well is reported and discussed. Analysis of the hydrocarbon gases in Y-1 samples indicates that the longer chain hydrocarbon gasses (ethane, propane, butane) in these shales are significantly higher than in previous wells. The carbon contents of the Y-1 (Allegany County, New York) well, on the other hand, are somewhat lower than predicted from the hydrocarbon gas contents. There is still a positive relationship between the carbon and hydrocarbon gas contents, however. A similar relationship is also apparent between the sulfur and hydrocarbon gas contents. No unusual trends are observed in the porosity values, and a reasonable agreement exists between the measured Hg-intrusion values and those calculated from the density data. Higher porosity values are associated with low bulk densities. From limited lithological observations New York shales exhibit variable clay, mineral, and quartz contents. Generally, low levels of pyrite and carbonate minerals are observed. The low pyrite and carbonate contents noted in the powder examination of the samples are supported by the EDAX results showing low Ca and S contents. DOE

N80-20974# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
ASTROGRAVIMETRIC DETERMINATION OF THE GEOID Ph.D. Thesis - Tech. Hochschule Darmstadt, West Germany [EIN VERFAHREN ZUR ASTRO-GRAVIMETRISCHEN GEOIDBESTIMMUNG]
Dieter Lelgemann 1978 51 p refs In GERMAN
(Ser-C/Diss-247-Mitt-147) Avail: NTIS HC A04/MF A01

The computation of the geoid by several methods, including the Runge-Krarup theorem, is discussed using data taken in Germany. The use of a series of Kernel functions and the interpolations by astrogravimetric methods are reproduced for the German field. Author (ESA)

N80-20975# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DIFFERENTIAL GEOMETRY APPLIED TO GEODESY IN THE CASE OF THE GRAVITY FIELD OF THE EARTH Ph.D. Thesis - Tech. Hochschule, Darmstandt, West Ger. [UEBER GEODAETISCHE DIFFERENTIALGEOMETRIE IM ERDSCHWEREFELD]
Juergen Brennecke 1979 91 p refs In GERMAN
(Ser-C/Diss-250-Mitt-148) Avail: NTIS HC A05/MF A01

Applications of three dimensional geodesy in the domain of geometric representations of the gravitational field are presented. The method of calculation, based on Cartan and differential geometry in a Euclidean space, is used with a three dimensional orthonormal moving reference system. The study of the curvatures, considered as a fundamental parameter for the geometry of the gravitational field, aids in calculating exactly or approximately in three dimensional geodesy. Author (ESA)

N80-20976# National Geodetic Survey, Rockville, Md.
OPTIMIZATION OF HORIZONTAL CONTROL NETWORKS BY NONLINEAR PROGRAMMING
Dennis G. Milbert Aug. 1979 50 p refs
(PB80-117948; NOAA-TR-NOS-79-NGS-12; NOAA-79100108)
Avail: NTIS HC A03/MF A01 CSCL 08E

Some practical aspects of horizontal control network design are considered, and the techniques of linear and nonlinear programming are briefly reviewed. Rotationally invariant constrains are written for the coordinate variance sum at each station. These constrains are also quasi-homogeneous in the sense that a Moore-Penrose generalized inverse is used in computation. The objective function to be minimized is a cost proportional to the number of observations. Results are displayed for serval test networks. Methods of improvement of the design algorithm are then discussed. GRA

N80-20977# National Geodetic Survey, Rockville, Md.
NATIONAL GEODETIC SURVEY DATA: AVAILABILITY, EXPLANATION AND APPLICATION
Joseph F. Dracup Jan. 1979 47 p refs
(PB80-118615; NOAA-TM-NOS-NGS-5; NOAA-79100501)
Avail: NTIS HC A03/MF A01 CSCL 08E

A concise listing of geodetic publications and papers of general interest and their sources of availability are presented. Also included are detailed references to the application of geodetic control and practices. GRA

N80-20978# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
LONG-PERIOD TERMS IN THE NEUTRAL DENSITY OF THE UPPER ATMOSPHERE
A. Eisner and S. M. Yionoulis Nov. 1979 96 p refs
(Grant NSF ATM-77-21020)
(PB80-119464; JHU/APL-CP-076) Avail: NTIS HC A05/MF A01 CSCL 04A

A simple atmospheric density model is presented for Transit satellite altitudes (900 to 1200 km), based on 4.3 years (1974-1978) of data for all five Transit System satellites. The model incorporates altitude, solar, magnetic, annual, semiannual, diurnal, and seasonal-latitudinal variations. In addition to these known effects, a month period evidenced in the data was incorporated into the model. Several attempts (using different models) failed to elicit the four angle (local time) component of the diurnal effect. The results lead to the conclusion that diurnal variation is too weak to be detected. GRA

N80-20979# Universities Space Research Association, Boulder, Colo.
THE PRESENT STATUS OF ATMOSPHERIC ELECTRICITY, REPORT OF THE USRA ATMOSPHERIC ELECTRICITY STUDY PANEL Final Report
M. H. Davis 18 Sep. 1979 18 p
(Grant NSF ATM-78-19247)
(PB80-111479; USRA/BLDR-9/1) Avail: NTIS HC A02/MF A01 CSCL 04B

The present status of research in atmospheric electricity is examined. Recent directions of electrical research are discussed in the context of the atmospheric sciences. It is concluded that research in atmospheric electricity is now well positioned for significant advances, despite its relative isolation and unpopularity. GRA

N80-20980# Weidlinger Associates, New York.
RESONANCE ZONES ON THE SURFACE OF A DIPPING LAYER DUE TO PLANE SH SEISMIC INPUT
G. L. Wojcik Jan. 1979 99 p refs
(Grant NSF PFR-78-15049)
(PB80-107907; NSF/RA-790200; Rept-11) Avail: NTIS HC A05/MF A01 CSCL 08K

The local effects of lateral geologic inhomogeneity on surface ground motion during earthquakes was studied using a mathematical model. The model consisted of a surface dipping layer overlaying a halfspace, with plane SH waves incident from the halfspace in the downdip direction. Surface motion over the layers calculated for transient (time domain) and harmonic (frequency domain) inputs. An extension of the analysis suitable for Love wave excitation, is described. Applications include seismic zonation, critical facility sitting, building rehabilitation and ground failure. GRA

N80-20981# National Environmental Satellite Service, Washington, D. C.
AN IMPROVED MODEL FOR THE CALCULATION OF LONGWAVE FLUX AT 11 MICROMETERS
P. G. Abel and A. Gruber Oct. 1979 33 p refs
(PB80-119431; NOAA-TM-NESS-106; NOAA-79101901) Avail: NTIS HC A03/MF A01 CSCL 04A

A method for the prediction of outgoing longwave flux from satellite radiance measurements at 11 micrometers is presented. The method offers improved accuracy in estimated flux, especially at extreme flux values. It substantially reduces the discrepancy between the SR and ERB measurements, and also reduces derived outgoing longwave flux in the subtropical regions. GRA

N80-20640# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
A SURVEY OF THE GEODETICAL WORK OF THE IFAG FROM 1952-1977 [EIN UEBERBLICK UEBER DIE GEODAETISCHEN ARBEITEN DES IFAG (ABT. 2 DES DGFI) VON 1952-1977]
Hermann Seeger, Rudolf Brein, Dieter Ehlert, Dieter Leitgemann, Klemens Nottarp, Bernd Richter, and Gerhard Soltau *In its* Rept. on Cartography and Geodesy Ser. 1: Original Rept. No. 73 1977 p 39-51 *In GERMAN (For primary document see N80-20638 11-42)*
Avail: NTIS HC A11/MF A01

N80-20644# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
CONTRIBUTIONS TO THE UTILIZATION OF ALTIMETER DATA [ARBEITEN ZUR NUTZUNG VON ALTIMETER-DATEN]
Dieter Leitgemann *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 81-85 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20649# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DETERMINATION OF VARIATIONS OF TIME DEPENDENT COORDINATES THROUGH ASTRONOMICAL AND DOPPLER OBSERVATIONS [ZEITABHAENGIGE KOORDINATENAENDERUNGEN, BESTIMMT DURCH ASTRONOMISCHE BEOBACHTUNGEN UND DURCH DOPPLERBEOBACHTUNGEN]
Wolfgang Schlueter *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 117-120 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20652# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
EARTH TIDES [ARBEITEN ZUR ERDGEZEITENUNTERSUCHUNG]
Rudolf Brein *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 131-133 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20653# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
RESEARCH ON GRAVIMETRY AT IFAG [GRAVIMETRISCHE FORSCHUNGSARBEITEN AM INSTITUT FUER ANGEWANDTE GEODAESIE]
Heinrich Beetz and Bernd Richter *In its* Rept. on Cartography and Geodesy. Ser. 1: Original Rept. No. 73 1977 p 135-140 refs In GERMAN (For primary document see N80-20638 11-42)
Avail: NTIS HC A11/MF A01

N80-20658# Bayerische Akademie der Wissenschaften, Munich (West Germany).
DEVELOPMENT OF DOPPLER OBSERVATIONS AT WETTZELL DURING 1975-1976 [UEBER DIE AUSWERTUNG DER DOPPLERBEOBACHTUNGEN IN WETTZELL 1975-1976]
Wolfgang Schlueter *In its* Res. Program 78, Satellite Geodesy Program 1978 p 72-77 refs In GERMAN (For primary document see N80-20691 11-42)
Avail: NTIS HC A09/MF A01

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N80-20982 Florida Univ., Gainesville.
ESTIMATING NOCTURNAL SURFACE TEMPERATURE IN FLORIDA USING THERMAL DATA FROM GEOSTATIONARY SATELLITE DATA
Ellen Yee-Ling Chan Chen 1979 294 p
Avail: Univ. Microfilms Order No. 8005447

Satellite data from the SMS/GOES system were used to study winter nocturnal surface temperature patterns on both a special and temporal basis. The areas of special interest were the Everglades Agricultural Area and transects perpendicular to the coast in central Florida. Consistent, persistent thermal patterns were observed which were highly correlated with 1.5 in ambient air temperature observed concurrently. Thermal patterns observed by the satellite on clear, calm nights revealed that the thermal characteristics of the soil/plant surface predominately influence the surface temperature. This influence overshadows latitudinal effects. Water (open, marsh, and soil moisture) was apparently the next most important factor after soil characteristics (organic versus mineral soils). The organic soil of the Everglades Agricultural Area was cold because of the low conductivity, heat capacity and bulk density; however, areas of excessively drained sandy mineral soils were also detectably colder. Dissert. Abstr.

N80-20983 Wisconsin Univ., Madison.
SUMMER CIRCULATION OVER SOUTH AMERICA FROM SATELLITE DATA Ph.D. Thesis
Hassan Virji 1979 162 p
Avail: Univ. Microfilms Order No. 8004748

Cloud winds obtained from geostationary satellite images for the southern summer are used to describe the tropospheric circulation over tropical and subtropical South America. The cloud winds are objectively interpolated onto a 5 degree grid and the gridded data are used to obtain the diurnal and time-averaged, upper (300-100 mb) and lower (900-700 mb) level tropospheric motion fields. Relative vorticity, horizontal divergence, and rotational and irrotational components of the mean circulation are estimated from the gridded data. The midtropospheric vertical motion field is determined through the kinematic method and the result is compared with estimates obtained from cloud area and heat budget methods using conventional radiosonde data. Upper level momentum and vorticity budgets for the mean circulation are also determined. Dissert. Abstr.

N80-20984 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
METEOROLOGICAL DATA, SERIES A MONOGRAPHS. VOLUME 3, NO. 1: A STUDY OF PREDICTION OF CHARACTERISTIC SYNOPTIC STRUCTURES WITH THE AID OF A NUMERICAL MODEL OF THE HUMID ATMOSPHERE Ph.D. Thesis [METEOROLOGISCHE ABHANDLUNGEN, SERIE A, MONOGRAPHIEN, BAND 3, HEFT 1: UNTERSUCHUNG ZUR VORHERSAGE CHARAKTERISTISCHER SYNOPTISCHER STRUKTUREN MIT HILFE EINES NUMERISCHEN MODELLS DER FEUCHTEN ATMOSPHAERE]
Eberhard Reimer Verlag Dietrich Reimer 1977 121 p refs In GERMAN Sponsored by Forschungsgemeinschaft
Copyright. Avail: Verlag Dietrich Reimer, Berlin

The condensation process on a large scale is represented by isentropic surfaces in a model of atmospheric moisture. A system of equations represents the isobaric surface despite difficulties in representing the isentropes in the plane. Thermodynamic calculations applied to the case of condensation and evaporation in the scale of the space are given. The proposed numerical model uses potential temperatures as vertical coordinates, giving improved accuracy. Author (ESA)

N80-20985# California Univ., Los Angeles.
INTERNATIONAL SCIENTIFIC INTEREST IN THE QUESTION OF CO2 INDUCED CLIMATE CHANGE
G. L. Potter Sep. 1979 10 p
(Contract W-7405-eng-48)

(UCID-18332) Avail: NTIS HC A02/MF A01

A survey to investigate the international interest in the CO2 effects on the climate is discussed. The gist of the survey dealt with predicting the future atmospheric CO2 concentrations, the climatic effects, the environmental effects, and the social, political, and economic consequences of a global environmental change. The various countries involved in researching the CO2 questions and their responses to the survey are discussed. A.W.H.

N80-20986*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

SIMULATION STUDY OF A GEOMETRIC SHAPE FACTOR TECHNIQUE FOR ESTIMATING EARTH-EMITTED RADIANT FLUX DENSITIES FROM WIDE-FIELD-OF-VIEW RADIATION MEASUREMENTS

William L. Weaver and Richard N. Green Washington Apr. 1980 29 p refs

(NASA-TP-1629; L-13373) Avail: NTIS HC A02/MF A01 CSCL 04B

Geometric shape factors were computed and applied to satellite simulated irradiance measurements to estimate Earth emitted flux densities for global and zonal scales and for areas smaller than the detector field of view (FOV). Wide field of view flat plate detectors were emphasized, but spherical detectors were also studied. The radiation field was modeled after data from the Nimbus 2 and 3 satellites. At a satellite altitude of 600 km, zonal estimates were in error 1.0 to 1.2 percent and global estimates were in error less than 0.2 percent. Estimates with unrestricted field of view (UFOV) detectors were about the same for Lambertian and limb darkening radiation models. The opposite was found for restricted field of view detectors. The UFOV detectors are found to be poor estimators of flux density from the total FOV and are shown to be much better as estimators of flux density from a circle centered at the FOV with an area significantly smaller than that for the total FOV. J.M.S.

N80-20987# Minority Services, Inc., Washington, D.C.

***INFERRED CLIMATOLOGY FOR U.S. AIRPORTS* Final Report**

Roy E. Wyett Nov. 1979 141 p ref

(Contract DOT-FA78WAI-881)

(AD-A080487; FAA-RD-79-110; FAA Proj. 152-462) Avail: NTIS HC A07/MF A01 CSCL 01/5

Based on climatological data from airports where weather observations are taken, a climatological value is derived for most U.S. airports. This value represents the percentage of time over a period of a year that one could expect to encounter ceilings less than or equal to 1,500 feet and/or visibilities less than or equal to 3 miles. R.C.T.

N80-20988# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex. Atmospheric Sciences Lab.

THE 19304D GSRS, MISSILE NUMBER 1046, ROUND NUMBER V-66, 23 AUGUST 1979

Aug. 1979 19 p

(DA Proj. 1P6-65702-D-127)

(AD-A079989; ERADCOM/ASL-DR-1056) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19304D GSRS, Missile Number 1046, Round Number V-66, are presented in tabular form. GRA

N80-20989# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.

THE 19304B GSRS, MISSILE NUMBERS 1139, 1051 AND 1037, ROUND NUMBERS V-61, V-62 AND V-63, 9 AUGUST 1979

Aug. 1979 22 p

(DA Proj. 1P6-65702-D-127)

(AD-A079994; ERADCOM/ASL-DR-1050) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of the 19304B GSRS, Missile Numbers 1139, 1051 and 1037, Round Numbers V-61, V-62 and V-63, are presented in tabular form. GRA

N80-20990# Air Force Geophysics Lab., Hanscom AFB, Mass.

A TEST OF THE CLIMATIC NORMALITY OF SYNTHETIC PROFILES OF ATMOSPHERIC LIQUID WATER CONTENT OVER THE USSR IN 1973 Environmental Research Papers

Y. Izumi 12 Jul. 1979 45 p refs

(AF Proj. 6670)

(AD-A077021; AFGL-TR-79-0154; AFGL-ERP-668) Avail: NTIS HC A03/MF A01 CSCL 04/2

To test the climatic normality of profiles of atmospheric liquid water content generated from conventional weather data for 11 stations in the U.S.S.R., profiles for the mid-seasonal months of 1973 were compared with profiles randomly selected from the 5-year period 1968-1972. No cause was found to suspect that 1973 was climatically atypical. GRA

N80-20991# Naval Oceanography Command Detachment, Asheville, N.C.

US NAVY AND MARINE CORPS METEOROLOGICAL STATION CLIMATIC SUMMARIES Progress Report, 1945 - 1977

Oct. 1979 248 p Supersedes AD-A012376

(AD-A076976) Avail: NTIS HC A11/MF A01 CSCL 04/2

The weather station climatic summaries included consist of approximately four pages per station: a climate narrative, station history, and two pages of tabular meteorological data. Data from sixty-one weather stations are reported. A.W.H.

N80-20992# Naval Environmental Prediction Research Facility, Monterey, Calif.

MONTHLY CLIMATOLOGY FOR EVAPORATION DUCT OCCURRENCE IN THE NORTH ATLANTIC OCEAN Final Report

Wayne Sweet Jun. 1979 41 p refs

(WF52551792)

(AD-A075524; NEPRF-TR-79-01) Avail: NTIS HC A03/MF A01 CSCL 04/2

Evaporation duct climatologies are given for 10 North Atlantic Ocean weather stations. Statistics for evaporation duct height, a measure of duct intensity, are presented in the forms of frequencies of occurrence for each month and histograms of percentages of occurrence for mid-months of each of the four seasons. These data can be used both for operational planning and as input to war gaming. GRA

N80-20993# Sandia Labs., Albuquerque, N. Mex. Environmental Research Div.

WIND CHARACTERISTICS FOR FIELD TESTING OF WIND CONVERSION SYSTEMS

Robert E. Akins Nov. 1979 55 p refs

(Contract EY-76-C-04-0789)

(SAND-78-1563) Avail: NTIS HC A04/MF A01

Techniques are presented to determine placement of instrumentation to be used in measurement of wind characteristics for field testing of wind energy conversion systems (WECS). Potential errors in the measurement of a reference wind velocity as a result of physical separation between an anemometer and a WECS and interference between the WECS and the reference anemometer are outlined. Methods of correcting errors caused by both of these sources are developed. DOE

N80-20994# National Oceanic and Atmospheric Administration, Washington, D. C. Environmental Data and Information Service.

MARINERS WEATHER LOG

Elwyn E. Wilson, ed. Sep. 1979 81 p

(PB80-113277; NOAA-79100101) Avail: NTIS HC A05/MF A01 CSCL 04B

In addition to its regular sections, the safety of the port of Manila as a shelter from tropical storms and the average number of tropical cyclones in the northwest Pacific area during 1978 are discussed. GRA

N80-20995# National Meteorological Center, Washington, D. C.

DAY-NIGHT DIFFERENCES IN RADIOSONDE OBSERVATIONS OF THE STRATOSPHERE AND TROPOSPHERE

Raymond M. McInturff, Frederick G. Finger, Keith W. Johnson, and James D. Laver Sep. 1979 54 p refs

(PB80-117989; NOAA-TM-NWS-NMC-63) Avail: NTIS HC A04/MF A01 CSCL 04B

Day-night differences in temperature and height were used

as the basis for a system designed to achieve compatibility between data measured by various radiosonde instruments. The resultant compatibility adjustments in reported data were prerequisite to the analysis of stratospheric constant-pressure charts above the 100 mb level, and for some instrument types they were significant even at tropospheric levels. GRA

N80-20996# Illinois State Water Survey, Urbana.
ECONOMICS OF WEATHER MODIFICATION: A REVIEW
Steven T. Sonka 1979 63 p refs
(Contract NOAA-7-14291)
(PB80-110398; ISWS/RI-89/79; WB0-01008) Avail: NTIS HC A04/MF A01 CSCL 04B

Gross benefits and costs of potential weather modification activities and the elements vital to a credible economic analysis of such activities are discussed. Precipitation augmentation, hail suppression, hurricane suppression, fog dispersal, and lightning suppression are among the activities evaluated. GRA

N80-20997# Illinois State Water Survey, Urbana.
HYDROMETEOROLOGICAL CHARACTERISTICS OF SEVERE RAINSTORMS IN ILLINOIS
Floyd A. Huff 1979 24 p refs
(PB80-110406; ISWS/RI-90/79; WB0-01009) Avail: NTIS HC A02/MF A01 CSCL 04B

A summary of available information on heavy rainstorms in Illinois obtained from analyses of data from various sources is presented. Primary emphasis is placed on the frequency distribution of areal mean rainfall in severe rainstorms having durations of 6 to 48 hours and producing excessive amounts over areas of 25 to 10,000 square miles. GRA

N80-20998# North Carolina State Univ. at Raleigh. Dept. of Geosciences.
BASIC STUDIES FLOW AND DIFFUSION OVER HILLS Final Report, 1 Sep. 1976 - 31 Aug. 1977
S. P. S. Arya and J. C. R. Hunt (Cambridge Univ., England) Sep. 1979 39 p refs Prepared in cooperation with Cambridge Univ., England
(Grant EPA-R-804653)
(PB80-112014; EPA-600/4-79-053; NCSU-FMR-5) Avail: NTIS HC A03/MF A01 CSCL 04B

Experiments were conducted with models of a bell shaped hill and a 2-D steep ridge in EPA's meteorological wind tunnel and salt-water stratified towing tanks in order to study the flow and diffusion of pollutants in complex terrain under both neutral and stably stratified conditions. Measurements were made of the flow structure as well as the concentration patterns around the hills due to point sources located at different heights and positions relative to the hills. GRA

N80-20999# National Weather Service, Washington, D.C.
METEOROLOGICAL CRITERIA FOR STANDARD PROJECT HURRICANE AND PROBABLE MAXIMUM HURRICANE WINDFIELDS, GULF AND EAST COASTS OF THE UNITED STATES
Richard W. Schwerdt, Francis P. Ho, and Roger R. Watkins Sep. 1979 347 p refs
(PB80-117997; NOAA-TR-NWS-23; NOAA-79101101) Avail: NTIS HC A15/MF A01 CSCL 04B

The criteria for determining wind fields along the Gulf and East coasts of the United States for the most severe hurricane reasonably characteristic of a region and for the hurricane producing the highest possible sustained wind at a specified coastal location are presented. A single limiting value for the meteorological parameters of peripheral pressure and central pressure is determined. Upper and lower limits are determined for the radius of maximum winds, forward speed, track direction, and inflow angle. Interrelations between the several parameters and latitude or longitude are investigated. GRA

N80-21000# National Oceanic and Atmospheric Administration, Washington, D. C. Federal Coordinator for Meteorological Services and Supporting Research.
NATIONAL WINTER STORMS OPERATIONS PLAN
Oct. 1979 43 p
(PB80-118425; FCM-79-3; NOAA-79100503) Avail: NTIS HC A03/MF A01 CSCL 04B

The special arrangement made in order to furnish special weather observations used in warning of severe winter storms along the Gulf and East Coasts from November 1978 to April 1979 are described. GRA

N80-21001# National Center for Atmospheric Research, Boulder, Colo.
THE HAILPAD: CONSTRUCTION AND MATERIALS DATA REDUCTION, AND CALIBRATION
Alexis B. Long, Richard J. Matson, and Edwin L. Crow Aug. 1979 89 p refs
(Grant NSF ATM-77-23757)
(PB80-103989; NCAR/TN-144/STR) Avail: NTIS HC A05/MF A01 CSCL 04B

The materials from which hailpads are constructed, the procedures for reducing hailpad data, and the methods used to calibrate these instruments are examined. It was found that a second degree polynomial adequate describes the pad calibration relation between dent minor axis and hail stone diameter. The effect of wind on the calibration is studied. GRA

N80-21002# National Environmental Satellite Center, Washington, D. C.
SATELLITE ACTIVITIES OF NOAA 1978
Jun. 1979 23 p
(PB80-112782; NOAA-79100504) Avail: NTIS HC A02/MF A01 CSCL 04B

The NOAA elements that participate in the polar orbiting and geostationary satellite systems are listed with descriptions of their individual programs. Satellite data uses described include wind and temperature determination, environmental warning services, and the monitoring of ocean, hydrological, agricultural, and fishery conditions. Space support activities are also discussed. K.L.

N80-21003# National Oceanic and Atmospheric Administration, Washington, D. C. Environmental Data and Information Service.
GATE RADAR RAINFALL ATLAS
Michael D. Hudlow and Vernon L. Patterson Mar. 1979 158 p refs
(PB80-121130; NOAA-79102201) Avail: NTIS HC A08/MF A01 CSCL 04B

As a part of the GARP Atlantic Tropical Experiment (GATE), quantitative precipitation observations were made during the summer of 1974 for an experimental array centered at 8 deg 30 min N. latitude and 23 deg 30 min W. longitude using four C-band digital radars complemented by shipboard rain gages. High resolution rainfall data sets covering a circular area (master array) extending approximately 204 km from the center of the experimental array were derived and were archived at the two GATE World Data Centers. The rainfall products were derived by using the hourly precipitation accumulations for 4 km square data bins as input. GRA

N80-21004# National Weather Service, Washington, D.C.
NATIONAL WEATHER SERVICE FORECASTING HANDBOOK NO. 1: FACSIMILE PRODUCTS
Robert E. Rieck, ed. Jul. 1979 307 p
(PB80-125255; NOAA-79112304) Avail: NTIS HC A14/MF A01 CSCL 04B

The method of production of facsimile products in the National Weather Service is explained. Formats are presented along with the theory behind the products. Theory is intended to acquaint the forecaster with the basic thinking behind the production of the facsimile product and to identify and explain the appropriate forecast model. GRA

N80-21005# Texas Dept. of Water Resources, Austin.
THE ECONOMIC EFFECTS OF WEATHER MODIFICATION ACTIVITIES. PART 1: CROP PRODUCTION Final Report
William Allaway, Lawrence Lippke, Robert Riggio, and Comer Tuck Mar. 1979 59 p refs
(Contract DI-14-06-D-7587)
(PB80-112048; TDWR/LP-21-1) Avail: NTIS HC A04/MF A01 CSCL 02B

The relationships between yield, technology, and weather for three crops in a fourteen county region of Texas were quantified

in order to estimate the economic effects of weather modification activities. Multiple regression analysis was used to estimate the crop yield response to assumed increases in average precipitation. The estimates of increased crop production were converted to monetary values and an input-output model was used to give a preliminary estimate of the economic activity generated in the region by increased crop revenues. Results of the study indicate that there are substantial direct increases in agricultural incomes resulting from assumed increases in average precipitation. GRA

N80-21006# Texas Dept. of Water Resources, Austin.
THE ECONOMIC EFFECTS OF WEATHER MODIFICATION ACTIVITIES. PART 2: RANGE PRODUCTION AND INTERINDUSTRY ANALYSIS Final Report
Lawrence Lippke Mar. 1979 92 p refs Sponsored by the Office of Atmospheric Resources Management
(Contract DI-14-06-D-7587)
(PB80-112055; TDWR/LP-21-2) Avail: NTIS HC A05/MF A01 CSCL 02B

The response of range yield to changes in the average amount of precipitation is studied. It is estimated that rainfall during the spring months is very important determining the condition of the range during the rest of the year. More specifically, a 10 percent increase in rainfall in April would have the largest effect on total income to area livestock producers. Studies of the total economic effects of additional rainfall in the Big SpringSnyder area reveals that an estimated increase of 984 thousand dollars to the total income could be realized if March rainfall was increased by 10 percent. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N80-21007 Florida State Univ., Tallahassee.
EQUATORIAL PACIFIC OCEAN VARIABILITY-SEASONAL AND EL NINO TIME SCALES Ph.D. Thesis
John Clifton Kindle 1979 148 p
Avail: Univ. Microfilms Order No. 8007470

A nonlinear, single-layer numerical model was used to examine the baroclinic response of the equatorial ocean to time-variable winds. The rectangular model basin extended 1,500 km south of the equator and 15,000 km zonally; open boundary conditions were employed at the southern boundary. Attention is focused on the equatorially trapped wave response to symmetric, zonal time-dependent winds. Numerical simulations of the anomalous El Nino event were performed by initializing the model at some stage of the average seasonal solution and, subsequently, modifying the mean winds in the central and western Pacific. Discussion is focused on the effects of the magnitude, duration and timing of both the relaxation and the subsequent intensification phases. Dissert. Abstr.

N80-21008# Synectics Corp., Rome, N. Y.
BATHYMETRIC DATA REDUCTION SUBSYSTEM Final Technical Report, Aug. 1976 - Oct. 1978
P. Bell and R. Howarth Griffiss AFB, N.Y. RADC Sep. 1979 49 p
(Contract F30602-76-C-0412; AF Proj. 4302)
(AD-A079624; C-T0756-W; RADC-TR-79-212) Avail: NTIS HC A03/MF A01 CSCL 08/2

The subject final technical report covers Phase 1 - the Basic Operating Capability of the Bathymetric Data Reduction Subsystem. The report discusses and evaluates problems encountered during Phase 1 and the solutions which Synectics Corporation provided to these problems. There are four parts to this report. First, a discussion of problems which is basically mathematical. Secondly, discussion of software accomplishments pertain to subsystem development. Part 3, method of inaccuracies occurring in data input and manipulation are discussed. Finally, the fourth part evaluates the scope and limitations of the hardware configuration along with system software provided by Data General Corporation. GRA

N80-21009# Maryland Univ., Cambridge. Horn Point Environment Labs.
DECLINE OF SUBMERGED AQUATIC PLANTS IN CHESAPEAKE BAY
J. Court Stevenson, Nedra Confer, and Catherine B. Pieper Jul. 1979 18 p Sponsored in part by Md. Dept. of Natural Resources, Annapolis, and EPA, Washington, D.C.
(PB80-114747; FWS/OBS-79/24) Avail: NTIS HC A02/MF A01 CSCL 08A

Highlights from the comprehensive document, 'Summary of Available Information on Chesapeake Bay Submerged Vegetation', are presented. The eleven most important submerged aquatic plants, their functions in primary production and in providing habitat, and the reasons for their decline are described. Natural stresses, such as overgrazing by animals, hurricanes, warming trend, and natural diseases are discussed. Man-induced stresses include pollution from sewage, agriculture, and petrochemicals as well as turbidity and displacement by dredging and boat traffic. GRA

N80-21010# National Ocean Survey, Rockville, Md. Test and Evaluation Lab.
WAVE SENSOR SURVEY
Richard L. Ribe Jul. 1979 48 p
(PB80-118581; NOAA-TR-NOS-78; NOAA-79101102) Avail: NTIS HC A03/MF A01 CSCL 08C

A study of selected scientific and engineering literature was conducted to survey the state-of-the-art of wave measurement technology. Brief descriptions of representative wave sensors and their principles of operation are given. GRA

N80-21011# Delaware Univ., Newark.
DELAWARE SEA GRANT COLLEGE PROGRAM Annual Report, 1977 - 1978
1979 27 p refs
(PB80-122401; NOAA-79102404) Avail: NTIS HC A03/MF A01 CSCL 08I

The activities of the Delaware Sea Grant College Program in fiscal year 1977-78, in which more than 30 individual research and education projects were carried out in seven major program areas, are summarized. The Delaware phase of the national project was devoted to the study of rip currents. Controlled Environment mariculture has remained a major area of activity and progress. GRA

N80-21012# Georgia Marine Science Center, Savannah.
HYDROGRAPHIC OBSERVATIONS IN THE GEORGIA BIGHT (APRIL 1978)
S. R. Lasley, L. P. Atkinson, J. J. Singer, and W. S. Chandler Jul. 1979 101 p refs
(Grant NOAA-04-7-158-44126)
(PB80-111453; TRS-79/5; NOAA-79092405) Avail: NTIS HC A06/MF A01 CSCL 08J

Chemical and physical data obtained during Georgia Bight Cruise (10-23 April 1978) aboard the R/V Columbus Iselin is presented. The investigation was part of a larger multi-institutional Department of Energy program to understand event scale, physical, chemical and biological processes of the South Atlantic Bight, the continental shelf region from Cape Hatteras to Cape Canaveral. The study reported here is concentrated in the Georgia Bight near Brunswick, Georgia. GRA

N80-21013# State Univ. of New York at Buffalo. Dept. of Civil Engineering.
COMPUTER MANUAL FOR CALCULATING WAVE-HEIGHT DISTRIBUTIONS ABOUT OFFSHORE STRUCTURES Interim Report
Volker W. Harms, Bijan Safaie, Shiu Nam Kam, and Joannes J. Westerink Sep. 1979 173 p Sponsored in part by NOAA, Rockville, Md., and New York Sea Grant Inst., Albany
(PB80-109150; SUNYBUF/WREE-79/04) Avail: NTIS HC A08/MF A01 CSCL 13J

Programs are presented for the diffraction of water waves by isolated cylindrical structures of arbitrary cross-sectional geometry. The solution of the boundary value problem is obtained using Greens' function. Programs are presented for the integral equation solution and an approximate superposition solution.

Usage guidelines and illustrative examples are presented along with numerical accuracy and limitations of the programs. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N80-21014*# National Aeronautics and Space Administration, Washington, D. C.

ON THE CELLULAR AUTOIMMUNE MECHANISM FOR ELIMINATING ERYTHROCYTES NORMALLY AND UNDER EXTREME INFLUENCES

Ya. I. Pukhova, I. A. Terskov, A. Ya. Anikina, and A. V. Shashkin Mar. 1980 15 p refs Transl. into ENGLISH from Patol. Fiziol. Eksp. Ter. (USSR), no. 2, Mar. - Apr. 1979 p 16-22 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75735) Avail: NTIS HC A02/MF A01 CSCL 06C

The presence of an autoimmune cellular mechanism for destroying erythrocytes on the basis of results of experiments in vivo is demonstrated in the blood and the organs. This mechanism is made up of a population of immunocompetent killer-lymphocytes which originates in the bone marrow and the thymus, and which is manifested in the local hemolysis effect. J.M.S.

N80-21015*# National Aeronautics and Space Administration, Washington, D. C.

ADRENOCORTICAL RESPONSE IN RATS SUBJECTED TO A STRESS OF RESTRAINT BY IMMOBILIZATION WHETHER ACCOMPANIED BY HYPOTHERMIA OR NOT

Lala Buchel, Monique Prioux-Guyonneau, and Lola Libian Apr. 1980 10 p refs Transl. into ENGLISH from Compt. Rend. Soc. Biol. (France), v. 168, no. 10-12, 1974 p 1202-1207 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-76119) Avail: NTIS HC A02/MF A01 CSCL 06C

The restraint associated with hypothermia which increases the adrenal activity in rats was investigated. In rats with normothermia or light hypothermia, the plasma and adrenal corticosterone levels increase at least threefold whatever the duration of restraint. Their return to normal values depends on the duration of the restraint. Exposure to cold produces in free rats a light hypothermia with an increase of the plasma and adrenal corticosterone levels, and in restraint animals an important hypothermia which does not potentiate the stimulation of adrenocortical activity induced by the restraint alone. R.C.T.

N80-21018*# National Aeronautics and Space Administration, Washington, D. C.

REDUCTION OF THE DURATION OF RESTRAINT FOR THE PRODUCTION OF EXPERIMENTAL ULCERS IN RATS: APPLICATION TO THE STUDY OF PROTECTIVE SUBSTANCES

L. Buchel and D. Gallaire Apr. 1980 7 p refs Transl. into ENGLISH from Compt. Rend. Soc. Biol. (France), v. 157, no. 6, 1963, p 1225-1228 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-76136) Avail: NTIS HC A02/MF A01 CSCL 06C

An experiment is described which was designed to cause ulcers in rats, but requiring less restraint time than previously used procedures. The method and results are presented. F.O.S.

N80-21017*# National Aeronautics and Space Administration, Washington, D. C.

FIFTH WORKING CONFERENCE (SPACE BIOLOGY) AT THE 21ST PLENARY SESSION OF COSPAR

S. S. Yurov Mar. 1980 4 p Transl. into ENGLISH from Radiobiologiya (USSR), v. 18, no. 4, May 1979 p 786 Conf. held at Innsbruck, 28 May - 10 Jun. 1978 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-76107) Avail: NTIS HC A02/MF A01 CSCL 06C

Space radiobiology is discussed with emphasis on the biological effects of heavy charged particles. Findings of spaceborne experiments on fungi, eggs, and seeds are presented. K.L.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N80-21018 Pennsylvania State Univ., University Park.

PLASMA CORTISOL LEVELS AND AUDITORY FUNCTIONING IN HUMANS EXPOSED TO SHORT AND PROLONGED DURATIONS OF NOISE Ph.D. Thesis

Thomas Edward Bennett 1979 154 p
Avail: Univ. Microfilms Order No. 8005976

Audiometric and hormonal effects of noise exposure were studied in male and female subjects exposed to moderately intense noise (85 dBA, broadband, pink noise) for short and prolonged durations. The major focus was on: (1) characterizing changes in circulating cortisol levels (using radioimmunoassay) before, during, and after noise exposure; (2) measuring the effects of noise on three facets of auditory perception (pure tone threshold sensitivity, level of initial masing perception, and loudness discrimination ability); and (3) examining possible relationships among duration of noise exposure, curculating hormone levels, and hearing ability in male and female human subjects. It was established that noise exposure results in a decreased ability to detect pure tones (threshold shifts), an increased ability to detect changes in loudness (a recruitment phenomenon), and a decreased ability to detect, tones in the presence of background noise (discrimination impairments). Dissert. Abstr.

N80-21019*# National Aeronautics and Space Administration, Washington, D. C.

INITIAL DYNAMICS OF THE EKG DURING AN ELECTRICAL DEFIBRILLATION OF THE HEART

I. I. Bikov, Ya. P. Chebotarov, and V. G. Nikolaev Apr. 1980 12 p refs Transl. into ENGLISH from Fiziol. Zh. Akad. Nauk Ukr RSR (USSR), v. 15, no. 3, 1969 p 322-327 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(NASA-TM-76002) Avail: NTIS HC A02/MF A01 CSCL 06P

In tests on 11 mature dogs, immobilized by means of an automatic blocking and synchronization system, artefact free EKG were obtained, beginning 0.04-0.06 sec after passage of a defibrillating current. Different versions of the start of fibrillation were noted, in application of the defibrillating stimulus in the early phase of the cardiac cycle. A swinging phenomenon, increasing amplitude, of fibrillation was noted for 0.4-1.5 sec after delivery of a subthreshold stimulus. Conditions for a positive outcome of repeated defibrillation were found, and a relationship was noted between the configuration of the exciting process with respect to the lines of force of the defibrillating current and the defibrillation threshold. It was shown that the initial EKG dynamics after defibrillation is based on a gradual shift of the pacemaker from the myocardium of the ventricles to the sinus node, through phases of atrioventricular and atrial automatism. Author

N80-21020*# National Aeronautics and Space Administration, Washington, D. C.

ATHEROSCLEROTIC CHANGES OF VESSELS CAUSED BY RESTRICTION OF MOVEMENT

G. S. Gvishiani, N. G. Kobakhidze, M. G. Mchedlishvili, and T. I. Dekanosidze Mar. 1980 7 p refs Transl. into ENGLISH from Soobshch. Akad. Nauk Gruz. SSR (USSR), v. 59, no. 3, 1970 p 701-704 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(NASA-TM-76022) Avail: NTIS HC A02/MF A01 CSCL 06S

The effect of restriction of movement on the development of atherosclerosis was studied in rabbits. Drastic restriction of movement for 20 and 30 days causes atherosclerotic alterations of the aorta and shifts in ECG which are characteristic of coronary atherosclerosis. At the same time, shortening of the duration of

blood coagulation and an increase in the content of catecholamines and beta-lipoproteids occur. R.C.T.

N80-21021*# National Aeronautics and Space Administration, Washington, D. C.

COLD SHIVERING ACTIVITY AFTER UNILATERAL DESTRUCTION OF THE VESTIBULAR APPARATUS

G. I. Kuzmina Mar. 1980 11 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR (USSR), v. 65, no. 11, 1979 p 1655-1660 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(NASA-TM-76099) Avail: NTIS HC A02/MF A01 CSCL 06P

The bioelectric activity of muscles (flexors and extensors of the forelimbs and hindlimbs) during cold shivering after unilateral destruction of the vestibular apparatus. It was found, that unilateral delabyrinthing produces bilateral facilitation of cold shivering in the flexor extremities more pronounced on the ipsilateral side. In the extensor muscles there was an absence of bioelectric activity both before and after delabyrinthing. Enhancement of cold shivering in the flexor extremities following intervention was evidently conditioned by removal of the inhibiting effect of the vestibulary apparatus on the function of special centers. R.C.T.

N80-21022*# National Aeronautics and Space Administration, Washington, D. C.

GLYCEROL TEST IN DIAGNOSING INCREASED INTRALABYRINTH PRESSURE

B. Ya. Limar, N. S. Mischanchuk, M. V. Kulikova, and V. I. Yermilova Mar. 1980 10 p refs Transl. into ENGLISH from Zh. Ushnykh Nosovykh Gorlovykh Bolez. (USSR), no. 6, Nov. - Dec. 1979 p 55-59 Transl. by Scientific Translation Service, Santa Barbara, Calif.

(Contract NASw-3198)

(NASA-TM-76110) Avail: NTIS HC A02/MF A01 CSCL 06E

The problem of increased intralabyrinth pressure as one of the causes of cochlear-vestibular disorders is discussed. A technique for conducting the glycerol test is presented. R.C.T.

N80-21023*# National Aeronautics and Space Administration, Washington, D. C.

COAGULATING ACTIVITY OF THE BLOOD, VASCULAR WALL, AND MYOCARDIUM UNDER HYPODYNAMIA CONDITIONS

B. V. Petrovskiy, ed., E. I. Chazov, ed., and S. V. Andreyev, ed. Mar. 1980 10 p Transl. into ENGLISH from the book "Aktual Nyye Problemy Gemostaziologii, Molekulyarno-Biologicheskiye i Fiziologicheskiye Aspekty" Moscow, Nauka Press, 1979 p 45-52 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3199)

(NASA-TM-76056) Avail: NTIS HC A02/MF A01 CSCL 06S

In order to study the effects of hypodynamia on the coagulating properties of the blood, vascular wall, and myocardium, chinchilla rabbits were kept for varying periods in special cages which restricted their movements. At the end of the experiment, blood samples were taken and the animals were sacrificed. Preparations were made from the myocardium venae cavae, and layers of the aorta. Two resultant interrelated and mutually conditioned syndromes were discovered: thrombohemorrhagic in the blood and hemorrago-thrombotic in the tissues. R.C.T.

N80-21024*# National Aeronautics and Space Administration, Washington, D. C.

PROPHYLAXIS AND TREATMENT OF SEASICKNESS

M. Yefremenko Mar. 1980 7 p ref Transl. into ENGLISH of Morsk. Sb. (USSR), no. 6, Jun. 1979 p 40-42 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3199)

(NASA-TM-76108) Avail: NTIS HC A02/MF A01 CSCL 06E

Depending upon the dominant type of symptoms, seasickness is divided into three forms: nervous, gastro-intestinal, and cardiovascular. Various medications are recommended appropriate to these forms. The first goal is normalization of impaired system functions as well as metabolism and the electrolyte and acid-base condition of the organism. Dietary recommendations are made and specific suggestions on the use of physical exercise, including prophylatic vestibular training exercises. Author

N80-21025*# National Aeronautics and Space Administration, Washington, D. C.

EFFECT OF SPACE FLIGHT ON SODIUM, COPPER, MANGANESE AND MAGNESIUM CONTENT IN THE SKELETAL BONES

A. A. Prokhonchukov, V. P. Taitsev, B. A. Shakhunov, V. A. Zhizhina, A. G. Kolesnik, and N. A. Komissarova Oct. 1979 11 p refs Transl. into ENGLISH from Patol. Fiziol. Eksp. Ter. (USSR), no. 6, Nov. - Dec. 1978 p 65-70 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3199)

(NASA-TM-75506) Avail: NTIS HC A02/MF A01 CSCL 06P

Sodium content decreased in the human skeletal bones and rose in the rat bones following space flight. In man copper content rose in the femoral bone and decreased in the vertebral body and the sternum, but was unchanged in the rest of the bones. Magnesium content was decreased in the femoral bone and the sternum, and in the vertebrae, but remained unchanged in the rest of the bones. Possible mechanisms of the changes detected are discussed. Author

N80-21026*# National Aeronautics and Space Administration, Washington, D. C.

EFFECTS OF HYPOKINESIA AND HYPODYNAMIA ON THE INTRAORGANIC ARTERIES OF THE HEART

L. A. Aleksina Mar. 1980 7 p refs Transl. into ENGLISH from Arkh. Anat., gistol. embriol. (USSR), v. 61, no.11, 1971 p 92-95 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3199)

(NASA-TM-76069) Avail: NTIS HC A02/MF A01 CSCL 06S

The experiments were performed on rabbits kept in small cages for 2-12 weeks. Their motor activity was greatly restricted. The arteries of the heart were injected with an India ink-gelatine mass; injection was directly into the coronary arteries. After fixation in 10% formaline solution 120 micron sections were cut. These were cleared by the Malygin method and examined with a light microscope. After exposure to hypokinetic conditions the picture of the cardiac arterial bed changed. During the first weeks the capillaries of the myocardium were significantly constricted, their course becoming sinuous. With prolonged exposure to hypokinetic conditions the vessels were found to dilate gradually and myocardial architectonics changed. Author

N80-21027# Illinois Univ. at the Medical Center, Chicago. Dept. of Occupational and Environmental Medicine.

MODEL FOR MEASURING THE HEALTH IMPACT FROM CHANGING LEVELS OF AMBIENT AIR POLLUTION: MORBIDITY STUDY

Tsukasa Namekata, Bertram W. Carnow, Zanet Flournoy-Gill, Eileen B. OFarrell, and Domenic Reda Aug. 1979 74 p refs (Contract EPA-68-02-2492)

(PB80-107030; EPA-600/1-79-024) Avail: NTIS HC A04/MF A01 CSCL 06T

The relationship between human health and ambient air concentrations of the major pollutants in the city of Chicago is examined using linear regression models to quantitatively estimate the degree of the air pollution contribution to emergency room visits for cardiac and respiratory diseases. According to the results, sulfur dioxide based on patient exposure levels accounts for about 13% of the variation of emergency room visits for acute bronchial and lower respiratory infections and about 22% for total cardiac diagnoses. Nitric oxide based on measurements from the closest site to the hospitals can account for about 7% of the variation of visits for total respiratory diagnoses, 6% for allergic conditions and upper respiratory infections, 4% for total cardiac diagnoses and 4% for hypertension and vascular heart diseases. GRA

N80-21028# Oregon State Univ., Corvallis. Dept. of Electrical and Computer Engineering.

ABSORPTION CHARACTERISTICS OF PROLATE SPHEROIDAL MODEL OF MAN AND ANIMALS AT AND NEAR RESONANCE FREQUENCY Final Report, 15 Sep. 1976 - 15 Mar. 1978

Vijai K. Tripathi and Hyuckjae Lee Aug. 1979 74 p refs
(Grant EPA-R-804697)
(PB80-108293; EPA-600/1-79-025) Avail: NTIS
HC A04/MF A01 CSCL 06R

The absorption characteristics of prolate spheroidal models consisting of homogeneous biological tissues radiated with plane waves at an arbitrary angle of incidence at and near the resonance frequency were evaluated. A general formulation of Stevenson's method in the third approximation is presented which can be applied to an arbitrary angle of incidence and leads to an improvement in frequency range of validity and accuracy as compared with first order solutions. The extended boundary condition method is also presented since it was found to be implementable for realistic models at frequencies approaching resonance. GRA

N80-21029# Research Triangle Inst., Research Triangle Park, N. C.
FORMULATION OF A PRELIMINARY ASSESSMENT OF HALOGENATED ORGANIC COMPOUNDS IN MAN AND ENVIRONMENTAL MEDIA Annual Report, Nov. 1976 - Dec. 1978
Edo D. Pellizzari, Mitchell D. Erickson, and R. A. Zweidinger Jul. 1979 469 p refs
(Contract EPA-68-01-4731)
(PB80-112170; EPA-560/13-79-006) Avail: NTIS
HC A20/MF A01 CSCL 06S

A model is developed for making a comparative assessment of halogenated organics in man and environmental media. The most prominent and biologically important substances are selected for an epidemiological study. K.L.

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N80-21030# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
K-LINES: A THEORY OF MEMORY
Marvin Minsky Jun. 1979 25 p refs
(Contract N00014-79-C-0260)
(AD-A078116; AI-M-516) Avail: NTIS HC A02/MF A01 CSCL 05/10

Most theories of memory suggest that when we learn or memorize something, some representation of that something is constructed, stored, and later retrieved. This raises questions like: How is information represented? How is it stored? How is it retrieved? Then, how is it used? This paper tries to deal with all of these at once. When you get an idea and want to remember it, you create a K-line for it. When later activated, the K-line induces a mental state resembling the one that created it. A partial mental state is a subset of those mental agencies operating at one moment. This view leads to many ideas about the development, structure and physiology of Memory, and about how to implement frame-like representations in a distributed processor. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N80-21031# National Technical Information Service, Springfield, Va.
SIGNS AND DISPLAY SYSTEMS: GRAPHIC DESIGN AND HUMAN ENGINEERING. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Nov. 1979
Edith Kenton Dec. 1979 196 p Supersedes NTIS/PS-78/1195; NTIS/PS-77/1081; NTIS/PS-76/0967; NTIS/PS-75/073
(PB80-803158; NTIS/PS-78/1195; NTIS/PS-77/1081; NTIS/PS-76/0967; NTIS/PS-75/073) Avail: NTIS
HC $30.00/MF $30.00 CSCL 05E

The bibliography contains annotated references to research reports covering varied aspects of design of signs and displays, particularly in the transportation field. Specific topics include: highway sign design; highway sign legibility, traffic control devices, transportation graphics; visual perception of aircraft instrument display systems; human engineering of symbols; and legibility of maps. This updated bibliography contains 189 abstracts, 19 of which are new entries to the previous edition. GRA

N80-21032# Federal Aviation Administration, Washington, D. C.
SUMMARY OF DEPARTMENT OF TRANSPORTATION/ FEDERAL AVIATION ADMINISTRATION TASK FORCE ON CREW WORKLOAD REPORT Final Report, May 1977 - Aug. 1978
George C. Hay, Charles D. House, and Richard L. Sulzer Dec. 1978 216 p refs
(AD-A068189; FAA-EM-78-15) Avail: NTIS
HC A10/MF A01 CSCL 01/2

An analysis of the total accident experience of U.S. certificated air-route carriers reveals that there is no evidence that a flight-deck crew of two in an appropriately designed aircraft is less safe than a crew of three pilots. A review of the procedures followed in the airworthiness certification of recent U.S. air-carrier aircraft indicates that manufacturers have demonstrated pilot workload in a fully modern and competent fashion, under the cognizance of FAA, and that actual crew complement approval is based on both the results of the workload demonstrations and the experience gained in a significant flight test program. A.R.H.

N80-21033*# Virginia Univ., Charlottesville. Dept. of Civil Engineering.
HUMAN COMFORT RESPONSE TO DOMINANT RANDOM MOTIONS IN LONGITUDINAL MODES OF AIRCRAFT MOTION
Ralph W. Stone, Jr. Jan. 1980 130 p refs
(Contract NAS1-14908)
(NASA-CR-159186; UVA/528156/MAE-CE79/130) Avail: NTIS HC A07/MF A01 CSCL 05H

The effects of random vertical and longitudinal accelerations and pitching velocity passenger ride comfort responses were examined on the NASA Langley Visual Motion Simulator. Effects of power spectral density shape were studied for motions where the peak was between 0 and 2 Hz. The subjective rating data and the physical motion data obtained are presented without interpretation or detailed analysis. There existed motions in all other degrees of freedom as well as the particular pair of longitudinal airplane motions studied. These unwanted motions, caused by the characteristics of the simulator may have introduced some interactive effects on passenger responses. J.M.S.

N80-21034*# Virginia Univ., Charlottesville. Dept. of Civil Engineering.
HUMAN COMFORT RESPONSE TO RANDOM MOTIONS WITH A DOMINANT PITCHING MOTION
Ralph W. Stone, Jr. Feb. 1980 94 p refs
(Contract NAS1-14908)
(NASA-CR-159140; UVA/528156/MAE-CE79/117) Avail: NTIS HC A05/MF A01 CSCL 05H

The effects of random pitching velocities on passenger ride comfort response were examined on the NASA Langley Visual Motion Simulator. The effects of power spectral density shape and frequency ranges from 0 to 2 Hz were studied. The subjective rating data and the physical motion data obtained are presented. No attempt at interpretation or detailed analysis of the data is made. Motions in all degrees of freedom existed as well as the intended pitching motion, because of the characteristics of the simulator. These unwanted motions may have introduced some interactive effects on passenger responses which should be considered in any analysis of the data. J.M.S.

N80-21035# Virginia Polytechnic Inst. and State Univ., Blacksburg. Human Factors Lab.
RESEARCH ON NEW ELECTRONIC DISPLAY TECHNOLOGIES Annual Summary Report, 1 Mar. 1978 - 31 Oct. 1979

H. L. Snyder, James C. Gutmann, and Willard W. Farley Dec. 1979 45 p refs
(Contract N00014-78-C-0238)
(AD-A079323; VPI-HFL-79-12/ONR-79-1) Avail: NTIS HC A03/MF A01 CSCL 05/8

This report summarized the work performed during the first year, dealing with two tasks. The first task, entitled 'Human Engineering Survey and Analysis', reviews the current flap panel display technologies, a summary of the human operator-critical characteristics of each technology, a technical summary of relevant human operator visual characteristics, and an evaluation of each technology by current visual display theoretical evaluation approaches. The second task, entitled 'Hue/Luminance Contrast Tradeoffs,' involved laboratory research designed to develop a metric by which luminance contrast and chrominance contrast can be traded off in display design to provide a metric of total effective display contrast. Work to date on both these tasks is summarized in this report. GRA

N80-21038# Calspan Advanced Technology Center, Buffalo, N.Y.
ESTABLISHMENT OF THE REPEATABILITY OF PERFORMANCE OF THE SA103C THREE YEAR OLD CHILD TEST DUMMIES Final Report, Sep. 1978 - Jun. 1979
Kenneth N. Naab and Stephen A. Baum Jun. 1979 137 p refs
(Contract DOT-HS-8-02022)
(PB80-112204; CALSPAN-6385-V-1; DOT-HS-805-071) Avail: NTIS HC A07/MF A01 CSCL 13L

The performance repeatability of four SA103C three year old child test dummies was investigated. The primary measures of dummy sled test performance analyzed with the statistical methods were: (1) peak head resultant acceleration; (2) peak chest resultant acceleration; (3) maximum head horizontal displacement and (4) maximum knee horizontal displacement. An analysis of the absolute deviations of each data point from the overall means demonstrated that the dummy variations were within an acceptable level for all performance measures. In addition, performance comparison overlay time history graphs are presented for direct comparisons. GRA

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

N80-21037*# Timoc International Co., Flintridge, Calif.
MIL-M-38510/470 TEST VECTORS: FAULT DETECTION EFFICIENCY MEASUREMENT VIA HARDWARE FAULT SIMULATION (Final Report, Nov. 1979 - Mar. 1980
Constantin C. Timoc 10 Mar. 1980 67 p refs Prepared for JPL
(Contracts NAS7-100; JPL-955502)
(NASA-CR-162916; JPL-9950-308) Avail: NTIS HC A04/MF A01 CSCL 09B

The stuck fault detection efficiency of the test vectors developed for the MIL-M-38510/470 NASA was measured using a hardware stuck fault simulator for the 1802 microprocessor. Thirty-nine stuck faults were not detected out of a total of 874 injected into the combinatorial and sequential parts of the microprocessor. Since undetected faults can create catastrophic errors in equipment designed for high reliability applications, it is recommended that the MIL-M-38510/470 NASA be enhanced with additional test vectors so as to achieve 100% stuck fault detection efficiency. K.L.

N80-21038# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Electrical Engineering.
AUTOMATED SYNTHESIS OF DIGITAL HARDWARE MODULES: SIMULATION AND VERIFICATION OF INTERCONNECTIONS Final Report, 1 Jun. 1978 - 31 Aug. 1979
Alice C. Parker and Donald E. Thomas 31 Oct. 1979 18 p refs
(Grant DAAG29-73-G-0070)
(AD-A078463; ARO-13670.16-EL) Avail: NTIS HC A02/MF A01 CSCL 09/2

The research described in this final report involves two basic areas: automated design and optimization of digital hardware, and simulation and verification of interconnections between digital system modules. Both of these are part of the CMU-DA (Design Automation) project (formerly called the RT-CAD project). We have investigated strategies for computer-aided optimization of the control part of digital systems hardware by developing a discrete optimization technique and a strategy for applying this technique. In addition, we have developed a design aid for computer interconnection evaluation by simulation techniques. Finally, we have begun to design a system to formally verify that a description of interconnections is functionally correct.GRA

N80-21039# California Univ., Los Angeles. Graduate School of Management.
GUIDELINES FOR EVALUATION OF MINICOMPUTER HARDWARE AND SOFTWARE: A USERS PERSPECTIVE
Bennet P. Lientz Dec. 1979 49 p refs
(Contract N00014-75-C-0266)
(AD-A078460) Avail: NTIS HC A03/MF A01 CSCL 09/2

Guidelines are presented for the evaluation and selection of hardware and system software for minicomputers. The evaluation is presented from a non-technical user point of view as opposed to a detailed technical comparison. The issues covered include defining an approach for computing, acquiring a minicomputer system, negotiation with vendors, installation and operation. Case examples are given along with examples of failure. GRA

N80-21040# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.
MAGNETIC BUBBLE RESEARCH Final Report, 15 Aug. 1975 - 30 Sep. 1978
Millard G. Mier Nov. 1979 55 p refs
(AF Proj. 2305)
(AD-A078702; AFAL-TR-79-1128) Avail: NTIS HC A04/MF A01 CSCL 09/2

Geometrical analysis techniques are used to derive computer memory system characteristics to support a hypothetical but realistic Air Force tactical mission scenario. Commercially available computer memory systems which might fulfill this requirement are reviewed and found unsuitable. Four emerging technologies which appear to have potential for fulfilling this requirement in the mid-1980's are reviewed and projected characteristics of a suitable capacity system based on each technology derived. The most promising technology, magnetic bubble memory, is examined and a major barrier to development is found to be the accurate characterization of materials supporting micron-sized magnetic bubbles. Standard techniques are examined for characterization of materials supporting very small magnetic bubbles. The failing of all techniques is optical microscopic resolution of these bubbles.

Three new techniques for this characterization, based on magnetic susceptibility changes with applied magnetic field, are examined and found to be suitable for small magnetic bubbles. A fast running Control Data Corporation (CDC) FORTRAN extended computer analysis program is described for analyzing experimental data and calculating all the static bubble materials parameters. GRA

N80-21041# National Technical Information Service, Springfield, Va.

MICROCOMPUTERS: GENERAL APPLICATIONS, PART 1, VOLUME 4. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, Apr. - Dec. 1977

Brian Carrigan Jul. 1979 309 p

(NTIS/PS-79/0726/4) Avail: NTIS HC $28.00/MF $28.00 CSCL 09B

The bibliography of worldwide research literature cites studies on the applications of microcomputers. These include automotive, testing, navigation, instrumentation, biomedical, machine tools, and other applications. This updated bibliography contains 303 abstracts, none of which are new entries to the previous edition. GRA

N80-20689# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

DATA CAPTURE FOR CARTOGRAPHIC DATA BASES

Helmut Ulrig *In its* Rept. on Cartography and Topographical Mess. Ser. 2: Transl. 1978 p 102-113 (For primary document see N80-20679 11-42)

Avail: NTIS HC A07/MF A01

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N80-21042 Purdue Univ., Lafayette, Ind.

HIGH ORDER FINITE DIFFERENCE METHODS FOR ELLIPTIC BOUNDARY VALUE PROBLEMS Ph.D. Thesis

Ronald Fernand Boisvert 1979 200 p

Avail: Univ. Microfilms, Order No. 8005835

An analysis of high order finite difference methods (HODIE) for the solution of linear elliptic boundary value problems in bounded regions of the plane, with particular attention to the Helmholtz problem is presented. The method attains high order accuracy while using only a compact nine point stencil whose coefficients are O(h) perturbations of a standard nine point discretization of the Laplacian (no derivative information is required). The implementation of a HODIE method for the Dirichlet problem for the Helmholtz equation on a rectangle is examined. The basic HODIE difference equation is then extended to handle mixed boundary conditions and nonrectangular domains. A fourth order discretization of the Helmholtz equation on a rectangle with constant coefficient mixed boundary conditions using a compact stencil is derived. Dissert. Abstr.

N80-21043*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

ISIS USERS MANUAL

Carolyn Grantham Mar. 1980 118 p refs

(NASA-TM-80144) Avail: NTIS HC A06/MF A01 CSCL 09B

A user manual for the interactive software invocation system (ISIS) is presented. The operational concepts and syntax of the interactive programming language are documented. K.L.

N80-21044*# Systems and Applied Sciences Corp., Riverdale, Md.

ADAPTATION AND OPTIMIZATION OF A LINE-BY-LINE RADIATIVE TRANSFER PROGRAM FOR THE STAR-100 (STARSMART)

Pamela L. Rarig Hampton, Va. NASA Langley Res. Center. Mar. 1980 34 p refs

(Contract NAS1-15481)

(NASA-CR-159238) Avail: NTIS HC A03/MF A01 CSCL 09B

A program to calculate upwelling infrared radiation was modified to operate efficiently on the STAR-100. The modified software processes specific test cases significantly faster than the initial STAR-100 code. For example, a midlatitude summer atmospheric model is executed in less than 2% of the time originally required on the STAR-100. Furthermore, the optimized program performs extra operations to save the calculated absorption coefficients. Some of the advantages and pitfalls of virtual memory and vector processing are discussed along with strategies used to avoid loss of accuracy and computing power. Results from the vectorized code, in terms of speed, cost, and relative error with respect to serial code solutions are encouraging. K.L.

N80-21045*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

WORKSHOP ON REAL-TIME PROGRAMMING FOR NASA FLIGHT PROJECT

John C. Knight Feb. 1980 11 p Workshop held at Hampton, Va., 17-19 Oct. 1979; sponsored by NASA, Langley Research Center, Hampton, Va. and the Inst. for Computer Applications in Science and Engineering

(NASA-TM-80236) Avail: NTIS HC A02/MF A01 CSCL 09B

The role of high-level languages in the preparation of real time flight software is discussed. K.L.

N80-21046# Maryland Univ., College Park. Dept. of Computer Science.

REGION REPRESENTATION RASTER-TO-QUADTREE CONVERSION

Hanan Samet May 1979 30 p refs

(Contract DAAG53-76-C-0138; DARPA Order 3206)

(AD-A078086; TR-766) Avail: NTIS HC A03/MF A01 CSCL 05/8

An algorithm is presented for constructing a quadtree for a binary image given its row-by-row description. The algorithm processes the image one row at a time and merges identically colored sons as soon as possible so that a minimal size quadtree exists after processing each pixel. This method is spacewise superior to one which reads in an entire array and then attempts to build the quadtree. Analysis of the algorithm reveals that its execution time is proportional to the number of pixels comprising the image. GRA

N80-21047# Stanford Univ., Calif. Electronics Labs.

SYNDIA USERS GUIDE

Warren E. Cory Aug. 1979 40 p

(Contracts DAAG29-79-C-0047; N00014-75-C-0601)

(AD-A075538; SU-SEL-79-028; TR-176) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report describes how to use the Syndia/Syngra system available at SU-SCORE. This system accepts a BNF-like grammar specification and automatically generates syntax diagrams on a Tektronix graphics terminal. Syndia is the major component of this system; Syngra acts as an interface between Syndia and the SUDS2 graphics editor. Syndia performs no ambiguity or consistency checks on the BNF input. This report assumes that the reader is familiar with BNF and syntax diagram representations of grammars. GRA

N80-21048# Stanford Univ., Calif. Dept. of Operations Research.

DOCUMENTATION OF A COMPUTER PROGRAM FOR HILLIERS HEURISTIC PROCEDURE IN INTEGER LINEAR PROGRAMMING

Nancy E. Jacqmi Jul. 1979 58 p ref

(Contract N00014-76-C-0418; Grant NSF MCS-76-81259)

(AD-A075576; TR-88) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report gives documentation for the computer code HEUR for finding good approximate solutions to integer linear programming problems using Hillier's heuristic procedure. A listing of the program with sample input and output is included. GRA

N80-20678# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

LINE GENERALIZATION AND DATA REDUCTION FROM

A MATHEMATICAL OPTIMIZATION POINT OF VIEW [LINIENGENERALISIERUNG UND DATENREDUKTION UNTER DEM GESICHTSWINKEL DER MATHEMATISCHEN OPTIMIERUNG]

Wigand Weber *In its* Rept. on Cartography and Topographical Meas. Ser. 1: Original Rept. No. 74 1978 p 55-66 refs In GERMAN; ENGLISH summary (For primary document see N80-20674 11-42)
Avail: NTIS HC A05/MF A01

N80-20688# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

EXPERIENCES GATHERED WITH A SYMBOL DISK WITH INTERCHANGEABLE SYMBOLS

Helmut Uhrig *In its* Rept. on Cartography and Topographical Meas. Ser. 2: Transl. 1978 p 93-106 refs (For primary document see N80-20679 11-42)
Avail: NTIS HC A07/MF A01

62 COMPUTER SYSTEMS

Includes computer networks.

N80-21049 Stanford Univ., Calif.

DESIGN AND PERFORMANCE OF LOCAL COMPUTER NETWORKS Ph.D. Thesis

John F. Shoch 1979 216 p
Avail: Univ. Microfilms Order No. 8006353

Alternative architectures for local computer networks are compared and a systematic effort to measure the performance characteristics of one such network is presented. Most networks fall into one of five major families: (1) partially connected systems using store-and-forward techniques; (2) star networks or hierarchical configurations; (3) rings and loops; (4) radio based approaches using packet broadcasting; and (5) multiaccess bus structures. From evalustion and analysis, one of the most attractive designs is found to be the use of a shared passive bus, run with a distributed control procedure. Performance of a system of this type is measured under conditions of normal load, high load, and overload. Under normal load there are very few errors, low delay, and the network easily supports the offered traffic. Under extremely high load the network utilization remains high (over 97%) and the sytem does not become unstable.

Dissert. Abstr.

63 CYBERNETICS

Includes feedback and control theory.

For related information see also 54 Man/System *Technology and Life Support.*

N80-21050*# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.

ASYMPTOTIC EIGENSTRUCTURES

Peter M. Thompson and Gunter Stein Apr. 1980 36 p refs (Contract NAG1-2)
(NASA-CR-162900; LIDS-P-982) Avail: NTIS HC A03/MF A01; CSCL 12A

The behavior of the closed loop eigenstructure of a linear system with output feedback is analyzed as a single parameter multiplying the feedback gain is varied. An algorithm is presented that computes the asymptotically infinite eigenstructure, and it is shown how a system with high gain, feedback decouples into single input, single output systems. Then a synthesis algorithm is presented which uses full state feedback to achieve a desired asymptotic eigenstructure. Author

N80-21051# Maryland Univ., College Park. Computer Science Center.

TEXTURE PRIMITIVE EXTRACTION USING AN EDGE-BASED APPROACH

Tsai-Hong Hong, Charles R. Dyer, and Azriel Rosenfeld May 1979 34 p refs (Contract DAAG53-76-C-0138; DARPA Order 3206) (AD-A078085; TR-763) Avail: NTIS HC A03/MF A01 CSCL 05/8

Many textures are characterizable as a collection of primitive elements arranged over a background field. This paper defines an edge-based procedure for extracting primitives from textures. The technique groups edges into region boundaries by joining facing pairs of edge points. A pilot evaluation is performed by examining the usefulness of these primitives for texture classification. GRA

N80-21052# Illinois Univ. at Urbana-Champaign. Decision and Control Lab.

SENSITIVITY ADAPTIVE CONTROL OF A MAGNETIC SUSPENSION SYSTEM M.S. Thesis

Yick Man Chan May 1979 97 p refs (Contract DAAG29-78-C-0016; Grants NSF ENG-74-20091; AF-AFOSR-3633-78; NSF INT-77-20969) (AD-A077148; UILU-ENG-78-2236; DC-25) Avail: NTIS HC A05/MF A01 CSCL 13/8

This project is concerned with the study of the behavior of a particular stochastic system, the magnetic suspension system, under the application of the Sensitivity Adaptive Feedback with Estimation Redistribution (SAFER) Control Algorithm. Matrix factorization techniques are used in the controller and estimator design for the system. Simulation results indicate that the magnetic suspension system can operate satisfactorily under the SAFER control method; and factorization techniques indeed enhance the numerical stability of computations. However, due to the complex structure of the SAFER control method, real time application of the algorithm may require faster computing device or simplified mathematical model. Its application will be most pertinent to system with slow time constants. GRA

N80-21053# Wisconsin Univ. - Madison. Mathematics Research Center.

CLOSED-LOOP EIGENVALUE SPECIFICATION FOR INFINITE DIMENSIONAL SYSTEMS AUGMENTED AND DEFICIENT HYPERBOLIC CASES Summary Report

D. L. Russell Nov. 1979 118 p refs (Contract DAAG29-75-C-0024; Grant AF-AFOSR-0018-79) (AD-A079727; MRC-TSR-2021) Avail: NTIS HC A06/MF A01 CSCL 12/1

We introduce a method for reduction of a class of distributed parameter control systems to a corresponding control canonical form which has the same intermediate 'control Jordan form' as the original system. Using this reduction together with certain results concerning the completeness and independence properties of complex exponentials we are able to study the problem of eigenvalue specification (pole placement for certain classes of hyperbolic systems which are more general than those discussed in the earlier paper). GRA

N80-21054# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.

COMPLIANCE AND FORCE CONTROL FOR COMPUTER CONTROLLED MANIPULATORS M.S. Thesis

Matthew Thomas Mason Apr. 1979 74 p refs (Contract N00014-77-C-0389) (AD-A077708; AI-TR-515) Avail: NTIS HC A04/MF A01 CSCL 13/8

Compliant motion occurs when the manipulator position is constrained by the task geometry. Compliant motion may be produced either by a passive mechanical compliance built into the manipulator, or by an active compliance implemented in the control servo loop. The second method, called force control, is the subject of this report. In particular, this report presents a theory of force control based on formal models of the manipulator and the task geometry. The ideal effector is used to model the manipulator, and the task geometry is modeled by the ideal surface, which is the locus of all positions accessible to the ideal effector. Models are also defined for the goal trajectory, position control, and force control. These models are useful in two respects. First, the model of force control provides precise semantics for force control primitives in manipulator programming languages. The model also defines a simple interface between the manipulator and the programmer, isolating the programmer from the fundamental complexity of low-level manipulator control.

Second, the formalism provides a method of synthesizing force control programs for compliant motion. A force control program is modeled as a set of equations in the components of manipulator velocity (angular velocity) and force (torque). The task geometry constraints can be modeled similarly. GRA

N80-21055# Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.
IMPROVEMENT OF A PROCESS TO IDENTIFY THE PARAMETERS FOR THE OPTIMAL CONTROL MODEL (BBN) [ENTWICKLUNG EINES VERFAHRENS ZUR IDENTIFIKATION DER PARAMETER DES BBN-MODELLS]
Uwe Kirchhoff 1978 146 p refs In GERMAN
(ILR-40; ISBN-3-79830-657-5) Avail: NTIS HC A07/MF A01

A description and mathematical representation of the functions of the optimal control model in time, and considering the limits of speed and vibration of the vehicle are given. The model must reproduce the structure of the model, different processes were adopted to obtain the parameters for the signal transmission, namely dead time, the time constant for the delay of neuromuscular action, and also the input signals from the ground which have been amplified by an optical regulator and a Kalman filter. Author (ESA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N80-21056 Maryland Univ., College Park.
HOMOLOGICAL INDICES AND HOMOTOPY CONTINUATION Ph.D. Thesis
Kathleen Tongue Alligood 1979 71 p
Avail: Univ. Microfilms Order No. 8006748

Topological conditions which ensure the existence of a path of solutions through a homotopy from a function with known solutions to the function in question are investigated. These conditions include nonzero intersection classes and such nonzero homological classes as the Lefschetz, Montgomery-Eilenberg, and Dold indices for fixed points and coincidence points. Equivariant results are also obtained, such as the Kakutani frame problem for 2- and 3-dimensional spheres. A relative index, analogous to the C.T. Yang homological index for spaces with involutions, is defined and applied to a generalized Borsuk-Ulam theorem. Dissert. Abstr.

N80-21057 State Univ. of New York, Buffalo.
RESULTS ON SUPERCOMPACT CARDINALS Ph.D. Thesis
Julius Barry Barbanel 1979 101 p
Avail: Univ. Microfilms Order No. 8005631

Various aspects of the notion of supercompactness are explored. The elementary embeddings that are associated with normal ultrafilters on supercompact cardinals are examined. In particular, a characterization based upon cofinality is established of which cardinals are fixed points of the embeddings. Given a supercompact cardinal, the collection of all associated normal ultrafilters can be put into a nice tree structure using the restriction operation on normal ultrafilters. The notion of an extendable normal ultrafilter is also discussed. It is established that every level has at least one nonextendible element, and that some levels have many non-extendible elements. Finally it is shown how assumptions about large cardinals above a supercompact cardinal yield additional structure information about the tree of normal ultrafilters. Dissert. Abstr.

N80-21058 Oregon State Univ., Corvallis.
NONLINEAR DIFFRACTION THEORY BY AN EIGENFUNCTION EXPANSION OF THE GREEN'S FUNCTION Ph.D. Thesis
Min-Chu Chen 1980 179 p
Avail: Univ. Microfilms Order No. 8007119

A second-order nonlinear diffraction theory is developed and discussed for a large diameter circular cylinder under the action of surface gravity waves of finite amplitude in water of finite depth. Boundary value problems are derived by using a perturbation expansion and the solutions for the diffracted waves are given in terms of Fredholm integral equations in which the resolvent kernel is a Green's function. Green's functions are obtained by the eigenfunction expansion method and the velocity potentials for the diffracted waves are recovered from Fredholm integral equations which incorporate the prescribed inhomogeneous boundary conditions and the Green's functions. Green's functions are extended to the second-order boundary value problem by an expansion in a complete set of orthonormal eigenfunctions. The dimensionaless hydrodynamic forces and moments on the cylinder are presented. Dissert. Abstr.

N80-21059*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APPLYING INTEGRALS OF MOTION TO THE NUMERICAL SOLUTION OF DIFFERENTIAL EQUATIONS
Donald J. Vezewski Mar. 1980 29 p refs
(NASA-TM-58225; JSC-16511) Avail: NTIS HC A03/MF A01 CSCL 12A

A method is developed for using the integrals of systems of nonlinear, ordinary, differential equations in a numerical integration process to control the local errors in these integrals and reduce the global errors of the solution. The method is general and can be applied to either scalar or vector integrals. A number of example problems, with accompanying numerical results, are used to verify the analysis and support the conjecture of global error reduction. Author

N80-21060# Maryland Univ., College Park. Computer Science Center.
SHAPE SEGMENTATION USING RELAXATION
Wallace S. Ruthowski, Shmuel Peleg, and Azriel Rosenfeld May 1979 31 p refs
(Contract DAAG53-76-C-0138; DARPA Order 3206)
(AD-A078084; TR-762) Avail: NTIS HC A03/MF A01 CSCL 05/8

Relaxation is applied to the segmentation of closed boundary curves of shapes. The ambiguous segmentation of the boundary is represented by a directed graph structure whose nodes represent segments, where two nodes are joined by an arc if the segments are consecutive along the boundary. A probability vector is associated with each node; each component of this vector provides an estimate of the probability that the corresponding segment is a particular part of the object. Relaxation is used to eliminate impossible sequences of parts, or reduce the probabilities of unlikely ones. In experiments involving airplane shapes, this almost always results in a drastic simplification of the graph, with only good interpretations surviving.Author (GRA)

N80-21061# Maryland Univ., College Park. Dept. of Computer Science.
COMPUTING PERIMETERS OF IMAGES REPRESENTED BY QUADTREES
Hanan Samet Apr. 1979 20 p refs
(Contract DAAG53-76-C-0138; DARPA Order 3206)
(AD-A078083; TR-755) Avail: NTIS HC A02/MF A01 CSCL 05/8

An algorithm is presented for computing the total perimeter of a binary image represented by a quadtree. The algorithm explores each segment of the border once and only once. Analysis of the algorithm shows that its worst-case average execution time is proportional to the product of the log of the image diameter and the number of nodes in the tree. Author (GRA)

N80-21062# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
A RECURSIVE LAGRANGIAN FORMULATION OF MANIPULATOR DYNAMICS AND A COMPARATIVE STUDY OF DYNAMICS FORMULATION COMPLEXITY
John M. Hollerbach Jun. 1979 26 p refs
(Contract N00014-77-C-0389)
(AD-A078067; AI-M-533) Avail: NTIS HC A03/MF A01 CSCL 05/8

A recursive formulation of manipulator dynamics based on the Lagrange equations has been developed. The efficiency of this formulation allows the dynamics to be computed in real time. The formulation is analogous to recently developed recursive Newton-Euler dynamics and shares the latter's efficiency. A

comparison of the number of adds and multiplies required under different Lagrangian, Newtonian, and tabular formulations shows that recursive formulations based either on the Lagrange or on the Newton equations offer the overall best method of dynamics calculation. GRA

N80-21063# Maryland Univ., College Park. Computer Vision Lab.

FAST PARALLEL REALIZATION OF MATRIX MULTIPLICATION Interim Report

E. V. Krishnamurthy and Reinhard Klette Nov. 1979 31 p refs

(Grant AF-AFOSR-3271-77; AF Proj. 2304)

(AD-A080074; TR-834; AFOSR-TR-80-0079) Avail: NTIS HC A03/MF A01 CSCL 12/1

Fast parallel matrix multiplication algorithms in SIMD (Single-Instruction-Multiple-Data) and MIMD (Multiple-Instruction-Multiple-data) modes are described for implementation in a parallel-binary matrix processing system with facilities for bit-wise parallel Boolean operation and power-of-two shifts on Boolean matrices. A comparative study of these algorithms is made on the basis of their relative time-complexities, when conventional binary and prime-modulus arithmetic are used for forming the matrix product. GRA

N80-21064# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

APPLICATION OF BAYESIAN APPROACH TO UPDATING AIR FRAME CERs M.S. Thesis

Walter D. Dietrich Sep. 1979 179 p refs

(AD-A077064; AFIT/GSM/SM/760-30) Avail: NTIS HC A09/MF A01 CSCL 15/5

This study investigates a Bayesian approach for developing a parametric equation which will estimate the recurring cost of the next lot/unit of an airframe program. Recurring costs are predicted because definitionally these costs are expected to reflect the cost for a follow-on production unit. Although the data base used for this study consisted of production cost information, the Bayesian approach may be useful for providing a parametric estimate of production cost using recurring costs from a prototype effort. However, until definitional problems associated with separating engineering and tooling costs into recurring and nonrecurring categories are resolved, predictions of production or next unit engineering and tooling costs will be marginal. Because of the definitional problem, total cost, (nonrecurring and recurring) was used in this study to develop Bayesian updated CERs for the engineering and tooling categories. GRA

N80-21065# Wisconsin Univ. - Madison. Mathematics Research Center.

AN ESTIMATE RELATED TO THE STRONG MAXIMUM PRINCIPLE Summary Report

Haiem Brezis and Pierre-Louis Lions Sep. 1979 11 p refs

(Contract DAAG29-75-C-0024)

(AD-A079705; MRC-TSR-1995) Avail: NTIS HC A02/MF A01 CSCL 12/1

Some of the most useful and important tools in the study of elliptic boundary value problems are maximum principles. So called strong maximum principles provide strict inequalities when appropriate conditions are fulfilled. In this work a strong maximum principle is improved by exhibiting an explicit estimate sharper than what follows from usual arguments. GRA

N80-21066# Brown Univ., Providence, R. I. Lefschetz Center for Dynamical Systems.

ON THE EXISTENCE OF SIMPLE LIAPUNOV FUNCTIONS FOR LINEAR RETARDED DIFFERENCE DIFFERENTIAL EQUATIONS

L. A. Carvalho, E. F. Infante, and J. A. Walker Jul. 1979 34 p refs

(Contract N00014-76-C-0278; Grants AF-AFOSR-3092-76; NSF MCS-78-18858)

(AD-A075553) Avail: NTIS HC A03/MF A01 CSCL 12/1

Liapunov functions of simple form have been used for the study of stability properties of difference-differential equations. In this paper we provide necessary and sufficient conditions for the existence of such functions. GRA

N80-21067# Wisconsin Univ. - Madison. Dept. of Statistics.

SOME NEW MATHEMATICAL METHODS FOR VARIATIONAL OBJECTIVE ANALYSIS USING SPLINES AND CROSS VALIDATION

Grace Wahba and James Wendelberger Sep. 1979 38 p refs

(Contract N00014-77-C-0675; Grant NSF ATM-75-23223)

(AD-A079302; UWIS-DS-578) Avail: NTIS HC A03/MF A01 CSCL 12/1

Sasaki (1960) introduced the idea of numerical variational analysis for objective analysis of meteorological fields. In the most general form of variational analysis considered here we seek a function phi(x,y,p,t,) of four variables representing a meteorological field of interest, say height, temperature, or a component of the wind field, as a function of ground projection coordinates (x,y), the vertical coordinate p, and time, t. This function should be suitably close to the height, temperature or wind field as measured at a finite set of positions, pressures and times, it should reflect known behavior of such fields, and it should be 'smooth' in some sense. GRA

N80-21068# Wisconsin Univ. - Madison. Mathematics Research Center.

THE BOLTZMANN EQUATION WITH A SOFT POTENTIAL PART 1: LINEAR, SPATIALLY-HOMOGENEOUS Summary Report

Russell Caflisch Oct. 1979 42 p refs

(Contract DAAG29-75-C-0024; Grants NSF MCS-78-09525; NSF MCS-76-07039)

(AD-A079706; MRC-TSR-2005) Avail: NTIS HC A03/MF A01 CSCL 12/1

The Boltzmann equation describes the evolution of a large system of particles. The configuration of particles changes due to the motion of the particles and the collisions of particles. The collisions proceed according to the force law between particles. The 'soft' forces considered here are ones for which the total effect of collisions is smaller for a particle of higher energy. If the system is close to equilibrium, then its evolution can be described approximately by linear equations. In this paper the linear Boltzmann equation with a soft potential is solved for all time. Previously only 'hard' potentials had been considered. GRA

N80-21069# Wisconsin Univ. - Madison. Mathematics Research Center.

ABSTRACT OPTIMALITY THEORY Summary Report

Szymon Dolecki Oct. 1979 62 p refs

(Contract DAAG29-75-C-0024; Grant AF-AFOSR-0018-79; NR Proj. 041-404)

(AD-A079707; MRC-TSR-2006) Avail: NTIS HC A04/MF A01 CSCL 12/1

This work presents an abstract optimality theory. The discussed concepts (e.g., extremal, Lagrangian, duality) are more general and much simpler than their familiar counterparts used in more concrete framework. They admit geometrical interpretations and help to clarify the underlying ideas of the theory. Consequently, the presented theory suggests further theoretical developments and possible applications. GRA

N80-21070# Wisconsin Univ. - Madison. Mathematics Research Center.

ON THE MAXIMALITY OF THE SUM OF TWO MAXIMAL MONOTONE OPERATORS

H. Attouch Nov. 1979 13 p refs

(Contract DAAG29-75-C-0024)

(AD-A079724; MRC-TSR-2018) Avail: NTIS HC A02/MF A01 CSCL 12/1

A wide variety of problems involving nonlinear partial differential equations, subject to boundary conditions, may be shown to have solutions by establishing that the associated differential operators satisfy a certain technical condition. This condition, called maximal monotonicity, allows the use of a well developed abstract theory which includes results about existence, regularity, etc., of solutions of operator equations. It is quite useful, therefore, to have easily verified conditions which imply that an operator is maximal monotone. Frequently an operator may be regarded as the sum of simpler components. This paper gives a new sufficient condition which guarantees that the sum

of two maximal monotone operators is again maximal monotone. GRA

N80-21071# Wisconsin Univ. - Madison. Mathematics Research Center.
BIFURCATIONS OF A MODEL DIFFUSION-REACTION
R. Aris Nov. 1979 28 p refs Presented at Conf. on Dyn. Systems, Asilomar, Calif., 9-14 Dec. 1974 Submitted for publication
(Contract DAAG29-75-C-0024)
(AD-A079725; MRC-TSR-2019) Avail: NTIS
HC A03/MF A01 CSCL 12/1

After some general observations on kinetic, compartmental and distributed systems a model suggested by Roessler is explored. Bifurcations to unsymmetric steady and uniform oscillatory states from the uniform steady states are demonstrated and the former are shown to break down into oscillations of increasing complexity. GRA

N80-21072# Wisconsin Univ. - Madison. Mathematics Research Center.
A GLOBALLY CONVERGENT BALL NEWTON METHOD Summary Report
K. L. Nickel Nov. 1979 34 p refs
(Contract DAAG29-75-C-0024)
(AD-A079728; MRC-TSR-2022) Avail: NTIS
HC A03/MF A01 CSCL 12/1

A new n-dimensional Newton method is presented. In each step a whole n-dimensional ball is determined rather than a single new approximation point. This ball contains the desired zero of the given function. The method is globally convergent. If the given initial ball does not contain any zero, then the method stops after a finite number of steps. Depending upon the assumptions which are made, the convergence of the ball radii is linear, superlinear or quadratic. Author (GRA)

N80-21073# Wisconsin Univ. - Madison. Mathematics Research Center.
ON SUBHARMONIC SOLUTIONS OF HAMILTONIAN SYSTEMS Summary Report
P. H. Radinowitz Nov. 1979 37 p refs
(Contracts DAAG29-79-C-0024; N00014-76-C-0300)
(AD-A079729; MRC-TSR-2023) Avail: NTIS
HC A03/MF A01 CSCL 12/1

Some existence results for T periodic solutions of (0.1) were presented in (1) for superquadratic Hamiltonian systems using finite dimensional minimax arguments together with estimates suitable to pass to a limit. An improved existence mechanism was introduced in (2) and applied to some of the superquadratic problems of (1) as well as to several subquadratic cases. It will show here that these problems possess not only one T periodic solutions z sub 1 but infinitely many distinct subharmonic solutions z sub k. A word of caution must be entered at this point. Although z sub k has period kT, it may not be the case that z sub k has minimal (i.e., primitive) period kT. Indeed simple examples show that there may be an upper bound on the minimal period of z sub k. GRA

N80-21074# Wisconsin Univ. - Madison. Mathematics Research Center.
ON EFFICIENT TIME-STEPPING METHODS FOR NONLINEAR SECOND ORDER HYPERBOLIC PARTIAL DIFFERENTIAL EQUATIONS Summary Report
R. E. Ewing Sep. 1979 28 p refs
(Contract DAAG29-75-C-0024; Grants DAAG29-78-G-0161; NSF MCS-78-09525)
(AD-A079731; MRC-TSR-1996) Avail: NTIS
HC A03/MF A01 CSCL 12/1

Techniques useful for efficiently time-stepping Galerkin methods for various types of time-dependent partial differential equations are presented and analyzed. Second-order quasilinear hyperbolic problems with smooth solutions are studied as a simple model problem for illustrating the widely applicable techniques. The procedure involves the use of a preconditioned iterative method for approximately solving the different linear systems of equations arising at each time-step in a discrete-time Galerkin method. Optimal order L2 spatial errors and almost optimal order work estimates are obtained for the second-order hyperbolic equation. Author (GRA)

N80-21075# Ohio State Univ. Research Foundation, Columbus. Dept. of Mathematics.
COMBINATORIAL PROBLEMS OF APPLIED DISCRETE MATHEMATICS Final Report, 15 Jun. 1972 - 30 Sep. 1977
D. K. Ray-Chaudhuri Dec. 1979 225 p refs
(Contract N00014-67-A-0232)
(AD-A079521; OSURF-760075/783430) Avail: NTIS
HC A10/MF A01 CSCL 12/1

This research program studied several important combinatorial problems that arise in the fields of statistical design of experiments, mathematical theory of communication, information theory, switching theory, information retrieval and graph theory. GRA

N80-21076# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PRACTICAL ASPECTS OF GAUSSIAN INTEGRATION
R. B. Holmes Oct. 1979 53 p refs
(Contract F19628-80-C-0002)
(AD-A079030; EDS-TR-79-265) Avail: NTIS
HC A04/MF A01 CSCL 12/1

A method for accurate numerical integration is proposed and illustrated by a variety of examples. The method depends on an ability to efficiently evaluate the weights and abscissas of Gaussian quadrature formulas, and software to achieve this purpose is also presented. GRA

N80-21077# IBM Watson Research Center, Yorktown Heights, N.Y.
NUMERICAL METHODS FOR STIFF NONLINEAR AND QUADRATIC DIFFERENTIAL EQUATIONS Interim Report
Werner Liniger 1979 11 p refs
(Contract F49620-77-C-0088; AF Proj. 2304)
(AD-A079303; AFOSR-79-1276TR) Avail: NTIS
HC A02/MF A01 CSCL 12/1

Generalizations of multistep and one-leg methods were defined for implicit differential systems with algebraic constraints. Such systems occur frequently in circuit analysis. An error analysis was carried out for three particular methods of this type, associated with an A() - contractive second-order Adams formula resulting from earlier research under this contract. Successful numerical tests of these methods were carried out. A complete set of affine invariants was derived for all two-by-two systems of first-order quadratic differential equations. These invariants provide a criterion for deciding to which affine equivalence class any given system belongs. It was shown that each contains a system which is equivalent to a single second-order equation in one unknown. Efficient numerical methods were developed for finding running solutions of the Josephson interferometer equations. Starting from perturbation solutions for small nonlinearities, the problem was formulated as a periodic boundary value problem and solved by finite differences and by continuation with respect to a parameter governing the 'degree of nonlinearity' of the problem. The existence of discontinuum of running solutions of the above mentioned equations was proved for arbitrarily strong nonlinearities with dissipation. For vanishing dissipation, the existence of a continuum of solutions was proved. GRA

N80-21078# Decisions and Designs, Inc., McLean, Va.
DECISION ANALYSIS: ENGINEERING SCIENCE OR CLINICAL ART
D. M. Buede Nov. 1979 62 p refs
(Contract N00014-79-C-0068; ARPA Order 3668)
(AD-A079035; TR-79-2-97) Avail: NTIS HC A04/MF A01 CSCL 12/1

This paper examines two philosophical poles concerning the structuring of decision-analytic models. The engineering science approach uses complex, engineering-like models to link the decision maker's alternatives to his or her value structure; a computer then calculates the decision-analytic answer. The clinical art approach develops a simple model that structures the decision maker's thoughts concerning a decision in such a way that the critical issues in choosing one alternative over another are readily apparent. Three exemplary applications of each philosophical pole are used to demonstrate that at the extremes, the work of practitioners can be categorized as we describe. A

discussion of the two practical extremes of decision analysis is then presented. In this discussion, dichotomous characteristics are assigned to the decision maker, the decision, and the analyst's constraints to portray conditions under which either the engineering science approach or the clinical approach would be more effective in producing appropriate insight and understanding. Then the implications of each approach are described in terms of the tools and procedure the decision analyst uses. Finally, the selection of the approach the decision analyst might use in any given application is graphically portrayed and discussed in terms of the points made in this paper. GRA

N80-21079# Brookhaven National Lab., Upton, N. Y.
DIFFERENTIAL GEOMETRIC METHODS FOR SOLVING NONLINEAR CONSTRAINED OPTIMIZATION PROBLEMS AND A RELATED SYSTEM OF NONLINEAR EQUATIONS: GLOBAL ANALYSIS AND IMPLEMENTATION
Kunio Tanabe 1978 10 p refs Presented at the Intern. Congr. on Numerical Methods for Eng., Paris, 27 Nov. - 1 Dec. 1978
(Contract EY-76-C-02-0016)
(BNL-26729; CONF-7811143-1) Avail: NTIS HC A02/MF A01

Robust method that can produce convergence from a very poor initial estimate of the optimal solution for larger problems are discussed. A differential geometric method is developed specifically to obtain robust algorithms without resorting to the penalty type approach in particular, a generic class of feasibility-improving gradient acute projection (FIGAP) methods and their Levenberg-Marquardt type modifications is developed for solving the general nonlinear constrained minimization problems. Each method in this class is an amalgamation of a generalized gradient projection method and a generalized Newton-Raphson method which, respectively, take care of reducing the value of the objective function and satisfying constraint equations at the same time. A unified theory is developed for the methods by using extensively the concept of various generalized inverses and related projectors, which facilitates geometric interpretation of the FIGAP methods. DOE

N80-21080# Los Alamos Scientific Lab., N. Mex.
IMPACT OF VECTOR PROCESSORS ON ALGORITHMS
B. L. Buzbee and A. L. McKnight Nov. 1979 7 p
(Contract W-7405-eng-36)
(LA-8123-MS) Avail: NTIS HC A02/MF A01

Algorithm construction is discussed in terms of obtaining high performance form advance computers architectures such as STAR 100, Cray-1, and other vector and parallel processors. In order to demonstrate how minor changes in the algorithm can greatly effect the computer efficiency a problem in diffusion is presented. J.M.S.

N80-21081# Los Alamos Scientific Lab., N. Mex.
GENERAL LEAST-SQUARES FITTING PROCEDURES TO MINIMIZE THE VOLUME OF A HYPERELLIPSOID
E. Alan Wadlinger Oct. 1979 11 p refs
(Contract W-7405-eng-36)
(LA-8096-MS) Avail: NTIS HC A02/MF A01

Several methods for determining the shape parameters, which in two dimensions are the Courant-Snyder parameters, and the volume of an ellipse or hyperellipse that represents a set of phase-space points in a two-or-more dimensional hyperspace are presented. The ellipse parameters are useful for matching a beam to an accelerating or transport system and in studies of emittance growth. The fitting procedure minimizes the total volume of a hyperellipse by adjusting the ellipse shape parameters. The total volume is the sum of the individual particle volume defined by the hyperellipse that passes through a particle's phase-space point. A two dimensional space is considered first; then results are generalized to a higher number of dimensions. DOE

N80-21082# Oak Ridge National Lab., Tenn.
LECTURES ON THE PRACTICAL SOLUTION OF DIFFERENTIAL EQUATIONS
L. Dresner Nov. 1979 113 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6920) Avail: NTIS HC A06/MF A01

The practical solution of ordinary and partial differential equations are presented. Explanitory material is given as well as detailed examples drawn from the fields of neutron transport, mass transfer, gas dynamics, and superconductivity,. In all cases the emphasis is placed on the attainment of practical results. DOE

N80-21083# California Univ., Livermore. Lawrence Livermore Lab.
INTERPOLATION AND DATA FITTING WITH SPLINES
F. N. Fritsch Nov. 1979 30 p refs
(Contract W-7405-eng-48)
(UCID-18329) Avail: NTIS HC A03/MF A01

A continuing education course, (interpolation and data fitting with splines) is presented. The following aspects of the course are treated: course description, course requirements, course structure, course outline and schedule, enrollment history, and software availability. DOE

N80-21084# Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
ON THE SCALE OF FLUCTUATION OF RANDOM FUNCTIONS
Erik H. Vanmarcke Apr. 1979 64 p refs
(Grants NSF ENV-76-19021; NSF PFR-78-15898)
(PB80-107865; R79-19; NSF/RA-790199) Avail: NTIS HC A04/MF A01 CSCL 12A

Results are presented for the average crossing rate and for the probability distribution of extremes of moving averages or integrals of random processes that are ergodic in the mean. The results are asymptotically exact when the averaging time grows to infinity and provide excellent approximations for all but very small averaging times. Perspectives are provided on the unifying role of the Gaussian random process toward which any stationary random process converges through local averaging or integration. The scale of fluctuation theta sub x is identified as a key parameter of any stationary random process. It is formally defined in terms of the variance function, but it has simple interpretations in terms of the autocorrelation function and the spectral density function. GRA

N80-20699# Bayerische Akademie der Wissenschaften, Munich (West Germany).
COMPARISON OF ALGORITHMS FOR THE SUMMATION OF SPHERICAL PLANE FUNCTIONS [VERGLEICH VON ALGORITHMEN ZUR SUMMATION VON KUGELFLAECHEN-FUNKTION]
Michael Gerstl *In its* Res. Program 78, Satellite Geodesy Program 1978 p 81-88 refs In GERMAN; ENGLISH summary (For primary document see N80-20691 11-42)
Avail: NTIS HC A09/MF A01

N80-20700# Bayerische Akademie der Wissenschaften, Munich (West Germany).
PROBLEMS OF APPROXIMATION BY MEANS OF SAMPLING FUNCTIONS [ZUR PROBLEMATIK DER APPROXIMATION MITTELS SAMPLING-FUNKTIONEN]
Heinz Fritz Schmidt *In its* Res. Program 78, Satellite Geodesy Program 1978 p 89-101 refs In GERMAN (For primary document see N80-20691 11-42)
Avail: NTIS HC A09/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N80-21085 Purdue Univ., Lafayette, Ind.
SOME CONTRIBUTIONS TO GAMMA-MINIMAX AND EMPIRICAL BAYES SELECTION PROCEDURES
Ph.D. Thesis
Ping Hsiao 1979 151 p
Avail: Univ. Microfilms Order No. 8005893

Results on gamma minimax selection procedures and empirical Bayes selection procedure are obtained and discussed. A problem of selecting populations close to a control is considered. It is assumed that there are (k + 1) normally distributed populations,

and one of them is a control population. A zero-one type loss function is defined. Bayes rules, gamma-minimax rules and minimax rules are derived and compared. Secondly the problem of selecting the t-best populations is examined. It is shown that if the populations have Polya Frequency Type 2 densities, then the natural selection rule is a gamma-minimax rule. Finally, a problem of selecting populations better than a control is considered. When the populations are uniformly distributed, empirical Bayes selection rules are derived for a linear loss function for both the known control parameter and the unknown control parameter cases. Dissert. Abstr.

N80-21086 Rensselaer Polytechnic Inst., Troy, N. Y.
ROBUST PROCEDURES FOR THE MULTIVARIATE NORMAL DISTRIBUTION Ph.D. Thesis
Nancy Jo Klein Delaney 1979 141 p
Avail: Univ. Microfilms Order No. 8004756

Two procedures are presented for joint estimation of location and dispersion parameters at or near the multivariate normal distribution. One procedure is based on characteristic functions and the other is based on a generalized likelihood function. Although of different origin, both procedures yield estimates which are jointly robust, consistent and asymptotically normal. Simulation studies show that these procedures are relatively efficient in normal sampling and out-perform traditional estimators in nonnormal sampling. Both procedures also provide outlier identification measures automatically via self weighting of the observations and protect estimates from distortions which could be caused by such spurious observations. Examples with real data show the application of these procedures to various multivariate analyses. Dissert. Abstr.

N80-21087/j Princeton Univ., N. J. Dept. of Statistics.
CONSISTENT ESTIMATION OF VARIANCE PARAMETERS FROM MANY SMALL SAMPLES WITH DIFFERENT MEANS
Nicholas P. Jewell and Gillian M. Raab (Edinburgh Univ.) Oct. 1979 17 p refs
(Contract N00014-79-C-0322)
(AD-A078227; TR-159-Ser-2) Avail: NTIS HC A02/MF A01 CSCL 12/1

Where sets of observations are normally distributed with variances related to the mean of each set, the mean values become nuisance parameters when we wish to pool information about the variances from a large number of sets of information. This paper considers the problem of obtaining consistent estimators of the variance parameters where no assumptions or prior knowledge are available about the mean values. When the variance is proportional to the square of the mean we obtain an estimator for the constant of proportionality which is always consistent, by a marginal likelihood approach, but this method cannot be generalized to other variance functions. Integrated, modified, and partial conditional likelihood methods are investigated for this example and suggest methods for the general example when the standard deviation is small compared with the mean. The partial conditional likelihood method may be a useful general method of eliminating nuisance parameters in problems where the methods proposed by Kalbfleisch and Sprott (1970) are not applicable. GRA

N80-21088/j Michigan State Univ., East Lansing. Dept. of Statistics and Probability.
LOCAL ASYMPTOTIC NORMALITY FOR PROGRESSIVELY CENSORED LIKELIHOOD RATIO STATISTICS AND APPLICATIONS
Joseph C. Gardiner Nov. 1979 30 p refs
(Contract N00014-79-C-0522)
(AD-A077005; RM-394) Avail: NTIS HC A03/MF A01 CSCL 12/1

Several investigations were made of the notion of local asymptotic normality of a family of probability distributions. The usefulness of this concept in problems of the theory of asymptotic estimation and hypothesis testing was demonstrated. A comprehensive examination of sets of conditions can be found ensuring the Lan for different families of probability distributions. Much attention has been focused on distributions connected with sequences of independent and identically distributed iid observations or those associated with a homogeneous Markov chain. In this paper conditions are presented ensuring the Lan for distribution connected with certain observations, which are neither independent nor identically distributed, when a class of stopping variables is incorporated in a natural way into the basic framework. The primary motivation for our study is the following situation which arises naturally in the context of clinical trials and life tests. GRA

N80-21089/j Stanford Univ., Calif. Dept. of Operations Research.
SIMULATING GENERALIZED SEMI-MARKOV PROCESSES
Lawrence D. Fossett Sep. 1979 104 p refs
(Contract N00014-76-C-0578; Grants NSF MCS-75-23807; NSF MCS-79-09139)
(AD-A075549; TR-50) Avail: NTIS HC A06/MF A01 CSCL 12/1

One approach to modeling queueing networks and other complex stochastic systems which has received some attention in the literature is the generalized semi-Markov process (GSMP). This idea is an example of the supplementary variables approach to non-Markovian systems. This approach supplements the natural description of the system by variables which contain information about the past history of the system. In this way, a model of a non-Markovian system can be made Markovian. For GSMPs the supplementary variables are clocks which record the amount of time until the occurrence of various events which could influence the system. Our approach to this problem is to find closely related regenerative processes on which to base the central limit theorem for the process under study. New results in the theory of Markov chains on a general state space make it clear how these regenerative processes can be constructed. GRA

N80-21090/j Stanford Univ., Calif. Dept. of Statistics.
SMOOTHNESS PRIORS AND THE DISTRIBUTED LAG ESTIMATOR
Hirogutu Akaik Aug. 1979 21 p refs
(Contract N00014-75-C-0442)
(AD-A075574; TR-40) Avail: NTIS HC A02/MF A01 CSCL 12/1

Shiller's distributed lag estimator based on a smoothness prior demonstrates the potential of the Bayesian approach to statistical model building. Nevertheless, when the number of significant lag coefficients is small the assumption of smoothness of the pattern of the lag coefficients may not be appropriate. In this paper, to cover such a situation, the smoothness is assumed for the behavior of the coefficients viewed in the frequency domain. This definition leads to a smoothness prior with a particularly simple form. Numerical result shows that the estimator based on this smoothness prior produces good estimates of the lag coefficients where Shiller's prior produces highly biased estimates. It is also observed that the new estimator produces reasonable results even when the Shiller's prior is more appropriate. The danger of introducing a bias by assuming a Bayesian model is stressed in the discussion. GRA

N80-21091/j Stanford Univ., Calif. Dept. of Operations Research.
PROPERTIES OF ISOTONIC ESTIMATORS OF MEAN LIFETIME IN A SIMPLE PROTOTYPE DEVELOPMENT MODEL Ph.D. Thesis
Thomas P. McWilliams Aug. 1979 113 p refs
(Contract N00014-75-C-0561)
(AD-A075578; TR-194) Avail: NTIS HC A06/MF A01 CSCL 12/1

Consideration of a simple prototype development/reliability growth model leads to observation of variables X1, X2, ... Xk where the X1 are independent and are assumed to have the same distribution type with individual means lambda sub i. The problem is to estimate the lambda sub i, which are assumed to be non-decreasing due to design improvements in the device under development. For many common distributions, estimation via the restricted maximum likelihood principle leads to estimates which are the isotonic regression of the X1 with appropriate weights. This paper finds the distribution of lambda cap sub k, the mle of lambda sub k, when the X1 are exponentially distributed. Lambda cap sub k is then compared with X-bar and Xk, two competing estimates of lambda sub k. Gamma, normal, and

Weibull distributed X1 are also considered, and the usefulness of lambda cap sub k is seen to depend on the relative magnitude of the variances and means of the X1. Results are also examined when the restricted rules are generated assuming the lambda sub i are a non-decreasing and concave function of 1. GRA

N80-21092# Stanford Univ., Calif. Dept. of Operations Research.
ON THE CANDIDATE DATE PROBLEM WITH A RANDOM NUMBER OF CANDIDATES
C. Derman, G. J. Lieberman, and S. Ross Aug. 1979 14 p refs Prepared in cooperation with Columbia Univ., N.Y. and California Univ., Berkeley
(Contracts N00014-75-C-0561; N00014-75-C-0620; N00014-77-C-0299; Grants NSF MCS-78-25146; AF-AFOSR-3213-77)
(AD-A075577; TR-192) Avail: NTIS HC A02/MF A01 CSCL 12/1

A decision maker has a total of M candidates to interview sequentially. The decision maker must either accept or reject the candidate being interviewed after he has been ranked with respect to his predecessors. Once rejected a candidate cannot be reconsidered; once a candidate is accepted no further interviews are carried out. The objective is to select the candidate in such a way as to maximize the probability of choosing the best of all M candidates (assuming every ordering of interviews is equally likely). GRA

N80-21093# Wisconsin Univ. - Madison. Mathematics Research Center.
THE USE OF THE TETRACHORIC SERIES FOR EVALUATING MULTIVARIATE NORMAL PROBABILITIES Technical Summary Report
Bernard Harris and Andrew P. Soms Oct. 1979 39 p refs
(Contract DAAG29-75-C-0024)
(AD-A079721; MRC-TSR-2015) Avail: NTIS HC A03/MF A01 CSCL 12/1

The tetrachoric series is a technique for evaluating multivariate normal probabilities frequently cited in the statistical literature. In this paper we have examined the convergence properties of the tetrachoric series and have established the following. For orthant probabilities, the tetrachoric series converges if the absolute value of rho sub ij < 1/(k-1), 1 < or = i <: < or = k, j - or - k, where rho sub ij are the correlation coefficients of a k-variate normal distribution. The tetrachoric series for orthant probabilities diverges whenever k is even and rho ij < 1/(k-1) or k is odd and rho sub ij > 1/(k-2), 1 < or = : <: < or + k Other specific results concerning the convergence or divergence or divergence of this series are also given. The prinicpal point is that the assertion that the correlation matrix is positive definite is false. GRA

N80-21094# Wisconsin Univ. - Madison. Mathematics Research Center.
NEARLY BALANCED INCOMPLETE BLOCK DESIGNS
Ching-Shui Cheng (California Univ., Berkeley) and Chien-Fu Wu Nov. 1979 20 p refs
(Contract DAAG29-75-C-0024; Grants NSF MCS-79-01846; NSF MCS-79-09502)
(AD-A079726; MRC-TSR-2020) Avail: NTIS HC A02/MF A01 CSCL 12/1

A class of nearly balanced incomplete block designs is defined. This extends the concept of regular graph designs of John and Mitchell (1977) to the unequally replicated case. Some necessary conditions on the existence of such designs are derived. Methods of construction are given for some special cases. For five or six varieties, the 'best' nearly balanced incomplete block designs and their efficiencies are tabulated. GRA

N80-21095# Union Carbide Corp., Oak Ridge, Tenn. Computer Sciences Div.
PROBABILISTIC METHOD FOR GROUPING DATA
C. L. Begovich Nov. 1979 191 p refs
(Contract W-7405-eng-26)
(ORNL/CSD/TM-65) Avail: NTIS HC A09/MF A01

A probabilistic method for grouping data was developed to incorporate measurement error into standard cluster analysis procedures. In the analysis, the data are perturbed by Monte Carlo techniques to simulate the experimental error, and the resultant data sets are clustered. By varying the number of clusters, a procedure is given to estimate the unknown number of groups. This technique and other standard procedures for determining the number of groups are described and compared for three different examples. The probabilistic method is shown to have advantages for determining the number of groups and the probabilities for a sample's membership in the hypothesized groups. DOE

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N80-21096# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
LOCAL SEARCH FOR THE ASYMMETRIC TRAVELING SALESMAN PROBLEM
C. Kanellakis and C. H. Papadimitriou Aug. 1979 29 p refs
(Grants NSF ATR-76-12036; NSF DAR-78-17826)
(PB80-118532; LIDS-P-927; NSF/RA-790232) Avail: NTIS HC A03/MF A01 CSCL 12B

The application of tour-to-tour improvements to the asymmetric traveling salesman problem (ATSP) is reported. An extension of the Lin-Kernighan local search algorithm was employed to solve the ATSP. Theoretical algorithm was employed to solve the ATSP. Theoretical results pertinent to the local search are presented together with a heuristic for the ATSP. Computational results strongly indicate that the algorithm used is very suitable for the solution of very large instances of the ATSP. Theoretical results which guided the design of the heuristic are discussed as well as some other aspects of local search and ATSP. GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N80-21097# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
SEQUINS AND QUILLS: REPRESENTATIONS FOR SURFACES TOPOGRAPHY
Berthold K. P. Horn May 1979 17 p refs
(Contract N00014-77-C-0389)
(AD-A078068; AI-M-536) Avail: NTIS HC A02/MF A01 CSCL 05/8

The shape of a continuous surface can be represented by a collection of surface normals. These normals are like a porcupine's quills. Equivalently, one can use the surface patches on which these normals rest. These in turn are like sequins sewn on a costume. These and other representations for information which can be obtained from images and used in the recognition and description of objects in a scene are briefly described. GRA

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N80-21098 Stanford Univ., Calif.
INSTANTANEOUS KINEMATICS OF MULTIPLE DEGREE-OF-FREEDOM MOTIONS Ph.D. Thesis
Jnaneshwar Hanumanth Nayak 1979 159 p
Avail: Univ. Microfilms Order No. 8006355

Results for the first order of instantaneous kinematics of three, four, and five degree-of-freedom motions are obtained and discussed. A unified approach is given for the so-called canonical description of the first order properties of a motion with any number of freedoms between one and six. Specifically, the

following is developed: Taylor series expansions of motions; the determination of canonical coordinate systems; the determination of instantaneous invariants; and the study of the loci of the instanteous screws. Application of the theory to the analysis of various linkage configurations is also discussed. Dissert. Abstr.

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N80-21099 City Univ. of New York, N. Y.
BRILLOUIN SCATTERING IN XENON NEAR THE CRITICAL POINT Ph.D. Thesis
Dennis Wonica 1979 241 p
Avail: Univ. Microfilms Order No. 8006480

The behavior of sound in xenon was investigated along the critical isochore and for temperatures .05 - 10 C above a critical temperature of 16.62 C. A laser Brillouin scattering experiment was assembled which used optical heterodyne detection combined with spectrum analysis and signal averaging. Sound velocity and sound attenuation data were obtained for frequencies in the region 1 - 15 MHz. Scattering angles were 0.36, 0.72, 1.44, and 2.69 deg. Electronic and optical instrumental effects were very carefully measured and deconvolved from observed spectra. A nonlinear least squares optimization algorithm was implemented using Fortran and used in a curve fitting procedure to accurately extract the Brillouin shift and Brillouin linewidth, from which the sound velocity and attenuation were determined, respectively. Dissert. Abstr.

N80-21100*# Columbia Univ., New York. Psychophysics Lab.
DEVELOPMENT AND EVALUATION OF A GENERAL AVIATION REAL WORLD NOISE SIMULATOR Final Report
Eugene Galanter and Richard Popper Mar. 1980 21 p refs (Grant NsG-1541)
(NASA-CR-159237) Avail: NTIS HC A02/MF A01 CSCL 20A

An acoustic playback system is described which realistically simulates the sounds experienced by the pilot of a general aviation aircraft during engine idle, take-off, climb, cruise, descent, and landing. The physical parameters of the signal as they appear in the simulator environment are compared to analogous parameters derived from signals recorded during actual flight operations. The acoustic parameters of the simulated and real signals during cruise conditions are within plus or minus two dB in third octave bands from 0.04 to 4 kHz. The overall A-weighted levels of the signals are within one dB of signals generated in the actual aircraft during equivalent maneuvers. Psychoacoustic evaluations of the simulator signal are compared with similar measurements based on transcriptions of actual aircraft signals. The subjective judgments made by human observers support the conclusion that the simulated sound closely approximates transcribed sounds of real aircraft. K.L.

N80-21101*# National Aeronautics and Space Administration, Washington, D. C.
A MODEL THEORY FOR THE FIBROUS ABSORBER. PART 1: REGULAR FIBRE ARRANGEMENTS
F. P. Mechel Mar. 1980 33 p refs Transl. into ENGLISH from Acustica, (West Germany), v. 36, no. 2, 1976 - 1977 p 53-64 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Univ. of the Saarland Acoustics Lab., Saarbrucke
(Contract NASw-3199)
(NASA-TM-75800) Avail: NTIS HC A03/MF A01 CSCL 20A

The axial propagation of sound waves in a model consisting of parallel fibers is calculated. The viscous forces and the thermal conduction are taken into account. This leads to viscous waves and to thermal waves besides the usual acoustic compression wave. The potential function for the total field near a fiber is treated as the superposition of the radiated field from the fiber itself and of the scattered fields from all the other fibers. The explicit field equations for a regular square fiber arrangement is derived and the influence of the order of symmetry of the arrangement is discussed. This leads to simplifications in the field equations and to field equations for the case of a homogeneous fiber distribution. J.M.S.

N80-21102# Naval Ocean Systems Center, San Diego, Calif.
SIX-FOOT LINE TRANSDUCER CALIBRATION PROCEDURE: EXPLAINS THEORY, METHODOLOGY, AND PROCEDURES USED AT SENSOR ACCURACY CHECK SITE (SACS), LONG BEACH, CALIFORNIA
Oct. 1979 45 p
(AD-A079522; NOSC/TD-291) Avail: NTIS HC A03/MF A01 CSCL 17/1

This technical document concerns the theory, method, and procedures by which the 6 foot line transducer in the moveable carriage at the Sensor Accuracy Check Site (SACS), Long Beach, California is to be calibrated. The equipment, physical and electronic setup, detailed data acquisition procedure, data quality assurance, and data reporting requirements are included. The procedure results in a measurement-to-measurement repeatability better than -0.7 dB. GRA

N80-21103# Purdue Univ., Lafayette, Ind. Dept. of Electrical Engineering.
RANDOM SIGNAL FLAW DETECTION Final Report, 21 Aug. 1975 - 28 Feb. 1979
Vernon L. Newhouse and Eric S. Furgason Jun. 1979 99 p refs
(Contract F33615-75-C-5252; AF Proj. 2387)
(AD-A078443; AFML-TR-79-4077) Avail: NTIS HC A05/MF A01 CSCL 17/1

This report describes four areas of work. In the first area random signal beam forming techniques are developed which make it possible to transmit several independent beams from a phased array using the same number of incoherent noise sources. Following this ultrasound beam scanning techniques are demonstrated in which random signal correlation systems and RF correlation systems using quadrature phase techniques are used in methods for scanning the intensity profile of ultrasound transducer beams using respectively broadband signals and narrow band signals. In addition two types of deconvolution procedure are described and demonstrated which have been successful in improving the effective resolution of ultrasound correlation systems when viewing surface features. Finally the design and construction of a random signal correlation system is described which uses an electronic delay line. GRA

N80-21104# Texas Univ. at Austin. Applied Research Labs.
PARRAY TECHNICAL PAPERS PRESENTED AT SCIENTIFIC AND TECHNICAL MEETINGS
Tommy G. Goldsberry, Voldi E. Maki, Jr., Wiley S. Olsen, C. Richard Reeves, and David F. Rohde 2 Aug. 1979 143 p refs
(Contract N00039-76-C-0231; ARPA Order 2910)
(AD-A077726; ARL-TR-79-4) Avail: NTIS HC A07/MF A01 CSCL 17/1

The parametric acoustic receiving array (PARRAY) exploits the inherent nonlinearity in the pressure-density relationship of water to achieve directional reception of low frequency acoustic waves using only two small high frequency transducers and some associated electronics. This report describes the PARRAY and summarizes several papers on the subject that have been presented at scientific and technical meetings. Copies of the papers are included as appendices. Procedures for selection of optimal parameter values are developed. State of the art advances in stable oscillators, reception of sideband signals with very small modulation indices, and simple high efficiency transducer elements are described. Results of experiments with a 340 m aperture PARRAY are presented which demonstrate that the experimental PARRAY is ambient noise limited in Lake Travis (Texas). GRA

N80-21105# Oak Ridge National Lab., Tenn.
ACOUSTIC EMISSION MONITORING OF STEEL AND CONCRETE STRUCTURAL ELEMENTS WITH PARTICULAR REFERENCE TO PRIMARY NUCLEAR CONTAINMENT STRUCTURES

D. J. Naus 1979 38 p refs Presented at the Intern. Conf. on Acoustic Emission, Anaheim, Calif. 10 Sep. 1979
(Contract W-7405-eng-26)
(CONF-790966-1) Avail: NTIS HC A03/MF A01

Advancements in nondestructive testing utilizing acoustic emission (AE) are discussed in terms of in-service monitoring of the structural integrity of primary containment structures. The capability of AE to monitor the structural integrity of primary nuclear containments was assessed. Intermediate pressure vessels tested under the Heavy-Section Steel Technology (HSST) Program and relatively simple concrete structures were monitored by AE while under test. The results of this monitoring program are discussed. DOE

N80-21106# California State Dept. of Transportation, Sacramento. Office of Transportation Lab.
NOISE MEASUREMENTS AND QUALITY ASSURANCE Final Report, 1977 - 1979
Roger D. Smith and Mas M. Hatano Mar. 1979 131 p refs Sponsored in part by FHA
(PB80-107246; FHWA/CA-79/06; TL-657253) Avail: NTIS HC A07/MF A01 CSCL 20A

A quality assurance program was developed for calibration of noise measurement equipment and the certification of personnel responsible for making noise measurements. The program is designed for use by the eleven districts and the transportation laboratory of the California Department of Transportation (Caltrans). An evaluation of various equipment calibration program alternatives was made and the most suitable to Caltrans' needs was selected and developed in detail. This program involves a mobile calibration and operator testing set-up that can be taken to each District office on an annual basis. Traceability to the National Bureau of Standards (NBS) is established by using standard microphones periodically calibrated by NBS. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N80-21107# Missouri Univ.-Rolla. Dept. of Physics.
COHERENCE IN PENNING IONIZATION AND FIRST KIND COLLISIONS: VOLUME RECOMBINATION OF IONS/ELECTRONS Progress Report, Dec. 1978 - Dec. 1979
L. D. Schearer and W. F. Parks Dec. 1979 27 p
(Contract N00014-75-C-0477; NR Proj. 343-011)
(AD-A079742; Rept-12) Avail: NTIS HC A03/MF A01 CSCL 07/4

A thermal energy beam of helium atoms in the metastable state is used to coherently excite ions of Sr, Ca, and Ba in a Penning collision. The anisotropic excited state distributions appears as Polarized line emission from the excited ions. The degree of ion alignment may be used to determine the populations of the quasi-molecular states of the ion-atom pair. The coherent emission is also utilized to obtain Hanle signals from which the radiative decay rate of the excited ion is determined. This is the first case in which coherence is produced in a collision process involving Penning ionization. The alignment of the Penning ions is an important new parameter in the description of these reactions. In an effort to extend such observations to molecular systems a nitrogen molecular metastable beam source was demonstrated. The use of metal vapor targets and the excitation rate of the excited states of Cd and Zn in energy transfer collisions with the N2(m) enable us to determine the vibrational distribution of the A 3Sigma state of N2 in the beam. Energy transfer cross sections and some Penning cross sections were measured in the beam system. GRA

N80-21108# Pittsburgh Univ., Pa. Atomic Sciences Inst.
ATOMIC AND MOLECULAR PROCESSES Progress Summary Report
M. A. Biondi, R. Johnson, and J. N. Bandsley 31 Oct. 1979 9 p
(Contract N00014-76-C-0098; ARPA Order 2686)
(AD-A079324; TPSR-26) Avail: NTIS HC A02/MF A01 CSCL 07/4

Contents: Electron-Ion Recombination under Laser Plasma Conditions; Ion-Molecule reactions of Laser Interest; Ion-Ion Recombination; Electron Collisions with Molecules; and Ion-Molecule Reactions. GRA

N80-21109# Ballistic Research Labs., Aberdeen Proving Ground, Md.
EFFECTS OF HIGH PRESSURE ON MOLECULAR ELECTRONIC SPECTRA. 2: MORSE-POTENTIAL FORMULATION
Robert C. Tompkins Nov. 1979 23 p refs
(DA Proj. 1L1-61102-AH-43)
(AD-A079898; AD-E430346; ARBRL-TR-02202) Avail: NTIS HC A02/MF A01 CSCL 07/4

The effects of high pressure on electronic spectra are treated on the basis of a Morse potential by a method analogous to that used in deriving the well-known Drickamer model. Expressions are presented for evaluating configuration-coordinate parameters for spectroscopic data. GRA

N80-21110# Michigan State Univ., East Lansing. Dept. of Chemistry.
PHOTOIONIZATION STUDIES OF MOLECULAR DYNAMICS AND ENERGETICS Final Technical Report, 15 Sep. 1975 - 14 Dec. 1978
G. E. Leroi Jul. 1979 5 p refs
(Contract N00014-76-C-0434; NR Proj. 394-009)
(AD-A079814) Avail: NTIS HC A02/MF A01 CSCL 07/4

The primary scientific accomplishment during the contractual period was the completion of a sophisticated, computer-controlled photoionization mass spectrometric instrument which was designed in our laboratory. Photoionization efficiency curves for parent and daughter ions of the chlorofluoromethanes, of acetonitrile and perdeuteroacetonitrile, and preliminary curves for several other molecules of aeronomical interest, were obtained. The potentiality of the instrumentation to study ion-molecule reactions was also successfully explored. GRA

N80-21111# Washington Univ., Seattle.
ANGULAR MOMENTUM TRANSFER IN DEEPLY INELASTIC COLLISIONS
R. Vandenbosch 1978 26 p refs Presented at the Conf. on Dynamical Properties of Heavy-Ion Reactions, Johannesburg, 1 Aug. 1978
(Contract EY-76-C-06-1388)
(RLO-1388-395; CONF-780857-3) Avail: NTIS HC A03/MF A01

Various experimental methods for determining the magnitude and the alignment of the angular momentum transferred from the initial relative orbital motion into the rotation of the final products are reviewed. The results from sequential fission studies are discussed. Comparisons with various theoretical models are presented. Evidence for the importance of both one body dissipation and the excitation of collective degrees of freedom is presented. DOE

N80-21112# California Univ., Livermore. Lawrence Livermore Lab.
SECONDARY ELECTRON RADIATION
V. V. Smirnov, ed. Feb. 1979 222 p refs Transl. into ENGLISH of Vtorichnoe Elektronnoe Izluchenie (Leningrad), 1977
(UCRL-Trans-11465; VAAP-SA-79/21) Avail: NTIS HC A10/MF A01

The characteristics of secondary electrons (energy spectra, angular distributions) are discussed using 26 papers on the energy and spatial characteristics of secondary electrons. The studies are directed towards the determination of the yields, spectra, and spatial distribution of secondary electrons, including low energy electrons, forming under the action of photon radiation in materials used for developing ionizing radiation detectors. The processes associated with the passage of electrons of various energies through matter (measurement of the energy loss spectra, degradation spectra, channelling, and shadowing effects) are examined. The development of theoretical methods for the determination of the characteristics of secondary electron radiation

and for the description of processes that accompany the passage of radiation through matter is discussed. A.W.H.

N80-21113# Illinois Univ., Urbana. Graduate Coll.
HIGH PRESSURE PHOTOPHYSICS OF ORGANIC MOLECULES Ph.D. Thesis
L. A. Brey 1979 105 p refs
(Contract EY-76-C-02-1198)
(COO-1198-1278) Avail: NTIS HC A06/MF A01

High pressure spectroscopic studies on several classes of organic compounds were made both in fluid solution (to 10 kbar) and in polymeric media (to 40 kbar). Three studies were conducted in fluid solution and concern the effect of solvent viscosity on the nonradiative deactivation rates from electronically excited states. Pressure was utilized to attain high viscosities in organic solvents at room temperature. The primary experimental technique used was fluorescence emission spectroscopy. In the fourth study, observations were made both in fluid solution and in plastic films. The focus of this study was the effect of pressure on the solvent-chromophore dispersion interaction in several polyenes and the concomitant changes in both the radiative and nonadaptive rates from the excited states. Extensive use was made of fluorescence lifetime measurements and excitation spectra. DOE

N80-21114# California Univ., Berkeley. Materials and Molecular Research Div.
LASER INDUCED FLUORESCENCE OF TRAPPED MOLECULAR IONS Ph.D. Thesis
F. J. Grieman Oct. 1979 255 p refs
(Contract W-7405-eng-48)
(LBL-10021) Avail: NTIS HC A12/MF A01

An apparatus for obtaining the optical spectra of molecular ions is described. The technique includes the use of three dimensional ion trapping laser induced fluorescence, and gated photon counting methods. The ions, which are produced by electron impact, are confined in a radio frequency quadrupole ion trap of cylindrical design. Because the quadrupole ion trap allows mass selection of the molecular ion desired for study, the analysis of the spectra obtained is greatly simplified. The ion trap also confines the ions to a region easily probed by a laser beam. DOE

N80-21115# Argonne National Lab., Ill.
PHYSICS WITH FAST MOLECULAR-ION BEAMS
D. S. Gemmell, ed. 1979 348 p refs Conf. held at Argonne, Ill., 20-21 Aug. 1979
(Contract W-31-109-eng-38)
(ANL/PHY-79-3) Avail: NTIS HC A15/MF A01

The interactions of fast (MeV) molecular-ion beams with matter are discussed with emphasis on such specialized topics as molecular-ion dissociation and transmission, wake effects, ionics charge states, cluster stopping powers, beam-foil spectroscopy, electron-emissions studies with molecular-ion beams, and molecular-ion structure determinations. DOE

N80-21116# Argonne National Lab., Ill.
***DETERMINATION OF MOLECULAR-ION STRUCTURES* THROUGH STUDIES OF THE COLLISIONALLY-INDUCED DISSOCIATION OF FAST (MeV) MOLECULAR IONS**
Donald S. Gemmell, Patrick J. Cooney, and Elliot P. Kanter 1979 18 p refs Prepared for 8th Intern. Conf. on Atomic Collision in Solids, Hamilton, Canada, 13-14 Aug. 1979
(Contract W-31-109-eng-38)
(CONF-790843-10) Avail: NTIS HC A02/MF A01

High-resolution studies of the angle and energy distributions of fragments detected in coincidence from the foil-and gas-induced dissociation of fast (MeV) polystomic molecular ions are described. The aim of the measurements is to explore the possibilities that these new techniques offer for determining the stereochemistry of molecular ions. DOE

N80-21117# Argonne National Lab., Ill.
COMPARISON OF JET SIZE IN ANTI-NEUTRINO PROTON *INTERACTIONS* WITH THAT *IN* POSITRON ELECTRON ANNIHILATION
M. Derrick, A. Fridman, P. Gregory, F. Lopinto, B. Musgrave, J. Schlereth, P. Schreiner, R. Singer, S. J. Barish, and R. Brock 1979 13 p refs Prepared in cooperation with Carnegie-Mellon Univ., Pittsburgh and Purdue Univ., Lafayette, Ind.
(Contract W-31-109-eng-38)
(ANL-HEP-PR-79-17) Avail: NTIS HC A02/MF A01

Using new antineutrino proton charged current data from a 15 foot hydrogen bubble chamber, some properties of the antineutrino induced hadronic jets are studied. The angular size of the jets is measured and compared with results from positron electron annihilation. The jets in the two processes are found to be quite similar in terms of the variables sphericity, thrust, and energy flow. DOE

N80-21118# Ohio State Univ., Columbus. Dept. of Physics.
DENSE AND DILUTE INSTANTON-ANTI-INSTANTON PAIR CONFIGURATIONS
William F. Palmer 1979 10 p refs
(Contract EY-76-C-02-1545)
(COO-1545-263) Avail: NTIS HC A02/MF A01

A Yang-Mills gauge field configuration is described which for large values of a separation parameter is an instanton-anti-instanton pair. At a minimum finite separation the field is a pure gauge. The interaction is calculated for large and small separations. According to an approximation algorithm the configuration is the most important quantum fluctuation about the exact solutions. DOE

N80-21119# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Physics.
PROGRAM IN MEDIUM ENERGY PHYSICS RESEARCH Progress Report, 1 Dec. 1978 - 30 Nov. 1979
H. B. Willard, P. R. Bevington, E. Winkelmann, and R. A. Leskovec 31 Oct. 1979 8 p refs
(Contract EY-76-S-02-2146)
(COO-2146-13) Avail: NTIS HC A02/MF A01

Theoretical medium energy nuclear physics research is reviewed in abstract length summaries. Research topics include the measurement of the spin core correlation parameter A sub NN in proton-proton elastic scattering at 796 MeV, proton-deuteron elastic scattering at 796 MeV, single and double pion production from 800 MeV proton-proton collisions, and the spin dependence of pion production by 800 MeV proton-proton collisions. A.W.H.

N80-21120# California Univ., Berkeley. Lawrence Berkeley Lab. Physics, Computer Science and Mathematics Div.
KAON-PROTON BACKWARD ELASTIC SCATTERING BETWEEN 476 AND 1084 MeV/c Ph.D. Thesis
Robert Preston Hamilton Sep. 1979 124 p refs
(Contract W-7405-eng-48)
(LBL-8969) Avail: NTIS HC A06/MF A01

The differential cross section for kaon-proton backward elastic scattering was measured in steps of 10 to 20 MeV/c between 476 and 1084 MeV/c. A negative kaon beam was focused onto a 21 cm long liquid hydrogen target and the forward scattered protons were identified kinematically by means of a single arm magnetic spectrometer. A Monte Carlo computer program aided in the subtraction of background events and in the calculation of correction factors. The data have an average statistical precision of 2.5 percent which is an order of magnitude improvement over previous results. Together with a partial wave analysis, the data give additional evidence for a resonance between 1700 and 1725 MeV. DOE

N80-21121# California Univ., Berkeley. Lawrence Berkeley Lab.
***NUCLEAR COLLISION AT E/A IS EQUIVALENT TO T/* SUB F/**
J. Randrup Jul. 1979 23 p refs Presented at the Symp. on Heavy-Ion Phys. from 10-200 MeV/AMU, Upton, N.Y., 16-20 Jul. 1979 Prepared in cooperation with Nordisk Inst. for Teoretisk Atomfysik, Copenhagen
(Contract W-7405-eng-48)
(LBL-9520; CONF-790743-8) Avail: NTIS HC A02/MF A01

A qualitative discussion of nuclear collisions in which the bombarding energy per nucleon is up to the order of the Fermi kinetic energy is presented. The significant processes encountered as bombarding energy increases from a few MeV to energies large in comparison with rest energies are sketched. An estimate of the nucleon mean free path is obtained, and nuclear dynamics

at moderate excitation is discussed. The calculated distribution of promptly emitted neutrons from the collision of 152 MeV C-12 with Gd-158 is shown. DOE

N80-21122# Fermi National Accelerator Lab., Batavia, Ill.
DEEP INELASTIC MUON SCATTERING AT FERMI LAB
M. Mugge Sep. 1979 44 p refs
(Contract EY-76-C-02-3000)
(COO-3000-T2) Avail: NTIS HC A03/MF A01

Experiment E203/391 was designed to have high sensitivity to any number of muons in the final state. This allowed a broad range of lepto-induced physics to be studied ranging from exotic 4 and 5-muon final states to deeply fundamental inelastic structure function measurements. The experimental apparatus and triggers are described along with the general scheme of the analysis. The results of the multimuon final states are outlined. DOE

N80-21123# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
STUDY OF THE INTERACTIONS OF RARE GAS MOLECULES BY MEASURING TOTAL AND DIFFERENTIAL TRANSVERSE SCATTERING Ph.D. Thesis - Goettingen Univ., West Germany [UNTERSUCHUNG VON EDELGAS-MOLEKUEL-WECHSELWIRKUNGEN DURCH MESSUNG TOTALER UND ROTATIONSAUFGELOESTER DIFFERENTIELLER STREUQUERSCHNITTE]
Jens Schleusener Aug. 1978 149 p refs In GERMAN
(MPIS-15/1978; ISSN-0436-1199; Rept-15) Avail: NTIS HC A07/MF A01; Max-Planck Inst. fuer Stroemungsforsch., Goettingen, West Germany DM 24,75

A universal instrument for measuring transverse dispersions was built. A precise determination was made of the energy potentials from the diffraction oscillations for He-Ne and D2-Ne, and for a superposition of rapid oscillations for Ar-Kr and Ar-CH4. For the system ND-Ne, the differential transversal rotative effect was measured in the case of the interaction of neutral particles. Author (ESA)

N80-21124# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
MEASURES OF THE TRANSVERSE DIFFERENTIAL EFFECT FOR THE ROTARY EXCITATION OF THE MOLECULE HD COLLIDING WITH Ne AND D2 Ph.D. Thesis - Goettingen Univ., West Germany [MESSUNG DIFFERENTIELLER WIRKUNGSQUERSCHNITTE FUER DIE ROTATIONSANREGUNG VON HD-MOLEKUELEN IM STOSS MIT Ne UND D2]
Friedrich Huisken Aug. 1978 127 p refs In GERMAN
(MPIS-16/1978; ISSN-0436-1199; Rept-16) Avail: NTIS HC A07/MF A01; Max-Planck Inst. fuer Stroemungsforsch., Goettingen, West Germany DM 21,30

The systems HD-Ne and HD-D2 were examined by a method of pseudostatistical analysis for the case of inelastic collisions. The range of transverse dispersions was studied for different levels of shock energy in relation with the molecular rotation and scattering angle. A comparison was made between elastic and inelastic systems. For the system HD-Ne, measurements of the inelastic transverse dispersion differential show correct values for the anisotropic potentials. Author (ESA)

N80-21125# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
DIRECT OBSERVATION OF THE REACTIONS OF THE ATOM O(1D) WITH HALOGEN COMPOUNDS OF METHANE AND WITH METHANE AND WATER [DIREKTE UNTERSUCHUNG DER REAKTION VON O(1D)-ATOMEN MIT HALOGENIERTEN METHANEN, METHAN UND WASSER]
Karl Kaufmann Nov. 1978 58 p refs In GERMAN
(MPIS-25/1978) Avail: NTIS HC A04/MF A01; Max-Planck Inst. fuer Stroemungsforsch., Goettingen, West Germany DM 11,70

Excited atoms of oxygen O(1D) produced by photolysis of ozone can react with halogen compounds of methane (namely the freons) in the upper atmosphere. An instrument was constructed to simulate the conditions of the reaction and analyze the reaction products. Results for the freons, CF3Br, CH4, and H2O are presented which show the distributions among the different possible reactions. Author (ESA)

N80-21126# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
A STUDY BY OPTICAL SPECTROSCOPY OF CHEMILUMINESCENT REACTIONS BETWEEN IONS AND MOLECULES FOR N(+)+NO YIELDS N2(+)* +O Ph.D. Thesis - Goettingen Univ. [UNTERSUCHUNG CHEMILUMINESZENTER IONEN-MOLEKUEL-REAKTIONEN]
Dietrich Brandt Mar. 1979 134 p refs In GERMAN Sponsored in part by Deut. Forschungsgemeinschaft (DFG)
(MPIS-4/1979) Avail: NTIS HC A07/MF A01; Max-Planck Inst. fuer Stroemungsforsch., Goettingen, West Germany DM 22,95

A spectrometer, adapted to determine the excitation level after a reaction between monatomic ions and diatomic molecules, is described. The photons emitted during the interaction of the ion beam and the gas were counted. UV emissions were observed in the spectral bands between 3,000 and 4,400 A during the interaction between ions N(+) and the gas NO at shock energy levels between 1 and 20 eV. A hypothesis concerning shock energy was used to compare the measurements and results of the simulation. Author (ESA)

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N80-21127 Stanford Univ., Calif.
UNIFIED GAUGE THEORIES IN NUCLEAR PHYSICS Ph.D. Thesis
Brian David Serot 1979 387 p
Avail: Univ. Microfilms Order No. 8006351

The application of unified gauge field theories to theoretical nuclear physics is discussed. Two problems are investigated in detail: the use of parity violation in semileptonic interactions with nuclei to determine the structure of the unified theory of the weak and electromagnetic interactions, and the extension of an existing relativistic nuclear quantum field theory to include the isovector pi and rho mesons within a spontaneously broken non-Abelian gauge theory. Dissert. Abstr.

N80-21128# Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
REMOTE EXPERIMENTAL FACILITY TO SOLIDIFY SRP HIGH-LEVEL WASTE
R. M. Galloway, M. J. Plodinec, E. L. Wilhite, and P. H. Chismar 1979 21 p refs Presented at Am. Nucl. Soc. Meeting, San Francisco, 12 Nov. 1979
(Contract EY-76-C-09-0001)
(DP-MS-79-53; CONF-791103-33) Avail: NTIS HC A02/MF A01

A small-scale equipment was developed and installed in a remotely operated experimental facility at the Savannah River Laboratory (SRL) to study immobilization of radioactive waste in glass. The facility has been in operation for nine months. During this period, two 25 liter batches of high-level waste from different SRP waste storage tanks were processed. The waste was boiled in sodium hydroxide to dissolve alumina trihydrate, washed with water to remove soluble salts, dried in a fluid bed dryer, and vitrified in a joule heated melter. Off-gases from the melter were collected for characterization. DOE

N80-21129# Department of Energy, Las Vegas, Nev. Operations Office.
NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS Quarterly Report, Apr. - Jun. 1979
Sep. 1979 62 p
(NVO-196-11) Avail: NTIS HC A04/MF A01

Seven subtasks are reported on: seismic, geology/hydrology, media (argillite, tuff, granite), NTS support, quality assurance,

technical overview, and spent fuel test. Yucca Mountain is recommended by USGS. DOE

N80-21130# Battelle Pacific Northwest Labs., Richland, Wash.
RESEARCH AND DEVELOPMENT ACTIVITIES: HIGH-LEVEL WASTE IMMOBILIZATION PROGRAM Quarterly Progress Report, Jan. - Dec. 1978
J. L. McElroy, J. E. Mendel, W. F. Bonner, and M. H. Henry May 1979 142 p refs
(Contract EY-76-C-06-1830)
(PNL-2999-Pt-1; PNL-2999-Pt-2) Avail: NTIS HC A07/MF A01

Progress reports from the high level waste immobilization program dealing with research activities on the solidification of high level radioactive waste are presented. Progress in waste fixation process development, waste form characterization, and alternative waste fixation processes are discussed. A.W.H.

N80-21131# Battelle Pacific Northwest Labs., Richland, Wash.
WASTE ISOLATION SAFETY ASSESSMENT PROGRAM. A BRIEF DESCRIPTION OF THE THREE-DIMENSIONAL FINITE ELEMENT GROUND-WATER FLOW MODEL ADAPTED FOR WASTE ISOLATION SAFETY ASSESSMENTS
C. R. Cole and S. K. Gupta Aug. 1979 57 p
(Contract EY-76-C-06-1830)
(PNL-2652) Avail: NTIS HC A04/MF A01

The three dimensional finite element ground water model described is for complex multilayered systems. The model is capable of simulating single layered systems having variable thickness or multilayered systems where not only thickness is varied, but the number of layers can be changed to agree with the vertical geological section. Supporting programs developed to plot grid values, contour maps, and three dimensional graphics of the input data used in simulation are discussed. The capabilities of the model are discussed using a test case consisting of the multilayered ground water system beneath Long Island, New York. DOE

N80-21132# Sandia Labs., Albuquerque, N. Mex.
SENSITIVITY ON THE PARAMETERS OF THE REGIONAL HYDROLOGY MODEL FOR THE NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS
R. L. Iman, J. M. Davenport (Texas Tech. Univ., Lubbock), R. K. Waddell (Geological Survey, Denver), H. P. Stephens, and D. I. Leap (Texas Tech. Univ., Lubbock) 1979 31 p refs Presented at 1979 DOE Statistical Symp., Gaithinburg, Tex., 24 Oct. 1979
(Contract EY-76-C-04-0789)
(SAND-79-1197C; CONF-791016-3) Avail: NTIS HC A03/MF A01

Statistical methodology was applied to the investigation of the regional hydrologic systems of a large area encompassing the Nevada test site (NTS) as a part of the overall evaluation of the NTS for deep geologic disposal of nuclear waste. Statistical techniques including Latin hypercube sampling were used to perform a sensitivity analysis on a two dimensional finite element code of 16 geohydrologic zones used to model the regional ground-water flow system. The Latin hypercube sample was modified to include correlations between corresponding variables from zone to zone. From the results of sensitivity analysis it was found that: (1) the ranking of the relative importance on input variables between locations within the same geohydrologic zone were similar, but not identical; and (2) inclusion of a correlation structure for input variables had a significant effect on the ranking of their relative importance. The significance of these results is discussed with respect to the hydrology of the region. DOE

N80-21133# Los Alamos Scientific Lab., N. Mex.
SELECTION OF POWER PLANT ELEMENTS FOR FUTURE REACTOR SPACE ELECTRIC POWER SYSTEMS
D. Buden, G. A. Bennett, K. Cooper, K. Davidson, D. Koenig, L. B. Lundberg, R. Malenfant, H. Martz, W. Ranken, and R. E. Riley Sep. 1979 354 p refs
(Contract W-7405-eng-36)
(LA-7858) Avail: NTIS HC A16/MF A01

Various types of reactor designs, electric power conversion equipment, and reject heat systems to be used in nuclear reactor power plants for future space missions were studied. The designs included gas cooled, liquid cooled, and heat pipe reactors. For the power converters, passive types such as thermoelectric and thermionic converters, and dynamic types such as Brayton, potassium Rankine, and Stirling cycles were considered. For the radiators, heat pipes for transfer and radiating surface, and pumped fluid for heat transfer with heat pipes as the radiating surface were considered. A heat pipe reactor design, thermoelectric converters, and a heat pipe radiator were selected. DOE

N80-21134# Reynolds Electrical and Engineering Co., Inc., Las Vegas, Nev.
OPERATIONAL RADIOACTIVE WASTE MANAGEMENT PLAN FOR THE NEVADA TEST SITE
Jul. 1979 44 p Prepared in cooperation with DOE, Las Vegas, Nev.
(Contract EY-76-C-08-0410)
(NVO-185-Rev-1) Avail: NTIS HC A03/MF A01

Procedures and methods for the safe receiving, processing, disposal, or storage of radioactive waste are presented. Nevada test site radioactive waste disposition program guidelines, procedures for radioactive waste management, description of storage areas and facilities, and a glossary of specifications and requirements are included. DOE

N80-21135# Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Plant.
TEMPERATURES GENERATED BY UNDERGROUND STORAGE OF DEFENSE WASTE CANISTERS
M. H. Tennant 1979 9 p refs Presented at Symp. on the Sci. Basic for Nucl. Waste Management, Boston, 26-29 Nov. 1979
(Contracts EY-76-C-09-0001; DE-AC09-76SR-0001)
(DP-MS-79-37; CONF-791112-11) Avail: NTIS HC A02/MF A01

For conditions conductive to leaching, i.e., moisture in contact with glass, the glass surface temperature would essentially be the canister cavity temperature because temperature rises across wet annuli are small. In turn, canister cavity temperatures are dominated by canister spacing for a given canister power and decay curve. Actual canister powers may be as much as 40% less than those used for these calculations. For dry salt in contact with the storage container, the temperature rises across the annuli may be large. The container temperature would tend to peak earlier for dry annuli than for wet annuli. When canister cavity temperatures peak, salt temperatures would be increased over normal approximately 500 feet in any direction extending from the repository. DOE

N80-21136# California Univ., Davis.
HIGH ENERGY PARTICLE PHYSICS RESEARCH Annual Progress Report
1979 16 p refs
(Contract EY-76-S-03-0034)
(SAN-0034-191-T1) Avail: NTIS HC A02/MF A01

Theoretical high energy physics research is reviewed in abstract length summaries. Research topics include the production of jets and single particles at large transverse momentum in photon-photon collisions, tests of quantum chromodynamics in two photon collisions, gluon jet production, and Higg's particle production. A.W.H.

N80-21137# Brown Univ., Providence, R. I. Dept. of Physics.
RESEARCH PROGRAM IN THEORETICAL HIGH-ENERGY PHYSICS Progress Report
D. Feldman, H. M. Fried, G. S. Guralnik, Kyungsik Kang, and Chung-I Tan Oct. 1979 19 p refs
(Contract EY-76-C-02-3130)
(COO-3130TA-347) Avail: NTIS HC A02/MF A01

Research topics in high energy theoretical physics are discussed. Included in the problems studied were flavor mixing angles in flavor gauge theory; grand unification schemes; neutral current phenomenology; charmonium decays; perturbative aspects of soft hadronic phenomena within the framework of the dual topological expansion; Regge trajectory slopes and the shape of the inclusive spectra; bound states in quantum electrodynamics; calculations of the Lamb Shift and hyperfine splitting in hydrogen;

collective behavior of instantons in quantum chromodynamics; 1/N expansion and mean field expansion techniques; group theoretic studies of spontaneous symmetry breaking; and fibre bundles applied to the topological aspects of gauge theories.
DOE

74 OPTICS

Includes light phenomena.

N80-21138* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NONCONTACTING METHOD FOR MEASURING ANGULAR DEFLECTION Patent
Emmett L. Bryant, inventor (to NASA) Issued 19 Feb. 1980 4 p Filed 23 Oct. 1978 Supersedes N79-11866 (17 - 02, p 0252)
(NASA-Case-LAR-12178-1; US-Patent-4,189,234; US-Patent-Appl-SN-953390; US-Patent-Class-356-152; US-Patent-Class-350-25; US-Patent-Class-350-285; US-Patent-Class-356-150) Avail: US Patent and Trademark Office CSCL 20F

An apparatus is described for indicating the instantaneous angular deflection of an object about a selected axis without mechanical contact with the object. Light from a light source is transmitted through a flat refractor to a converging lens which focuses the light through another flat refractor onto a differential photocell. The first flat refractor is attached to the object such that when the object is deflected about the selected axis the refractor is also deflected about that axis. The two flat refractors are identical and they are placed an equal distance from the converging lens as are the light source and the photocell. The output of the photocell which is a function of image displacement is fed to a high gain amplifier that drives a galvanometer which rotates the second flat refractor. The second refractor is rotated so that the image displacement is very nearly zero making the galvanometer current a measure of the deflection of the object about the selected axis.
Official Gazette of the U.S. Patent and Trademark Office

N80-21139 California Inst. of Tech., Pasadena.
OPTICAL DETERMINATION OF THE PROPERTIES OF EXCITONS BOUND TO IMPURITIES IN SEMICONDUCTORS Ph.D. Thesis
Kenneth Robert Elliott 1980 176 p
Avail: Univ. Microfilms Order No. 8006278

The electronic and optical properties of excitons bound to impurities in semiconductors are addressed with emphasis on the electronic structure of bound exciton states. The fundamental process in which a bound exciton is formed on a neutral acceptor in silicon is also reported. Three lines are shown to be in the absorption spectra of the acceptors Al, Ga, and In in silicon. Of the various schemes used to explain these lines, it is determined from the relative oscillator strengths that the correct scheme is one in which two $j=3/2$ holes are coupled to form states with total angular momentum $J=0$ and $J=2$. The cubic environment of the crystal in the neighborhood of the impurity leads to a splitting of the $J=2$ state. In the bound exciton spectra of Si:Tl, it is shown that four lines are in contrast to the three lines observed for the acceptors Al, Ga, and In. Other significant observations as well as the results are reported. Dissert. Abstr.

N80-21140* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DIFFRACTOID GRATING CONFIGURATION FOR X-RAY AND ULTRAVIOLET FOCUSING Patent
Sidney O. Kastner, inventor (to NASA) Issued 11 Mar. 1980 7 p Filed 18 Sep. 1978 Supersedes N78-32857 (16 - 23, p 3142)
(NASA-Case-GSC-12357-1; US-Patent-4,192,994; US-Patent-Appl-SN-943089; US-Patent-Class-250-280; US-Patent-Class-250-277CH; US-Patent-Class-350-162R; US-Patent-Class-356-334) Avail: US Patent and Trademark Office CSCL 20F

An aspheric grating is described which is operable to image local or distant point sources sharply in a designated wavelength, i.e., produce a perfectly stigmatic image in the given wavelength at grazing angles of incidence. The grating surface comprises a surface of revolution defined by a curve which does not have a constant radius of curvature but is defined by a nonlinear differential equation.
Official Gazette of the U.S. Patent and Trademark Office

N80-21141*# National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD AND APPARATUS FOR DOPPLER FREQUENCY MODULATION OF RADIATION Patent Application
Jack S. Margolis (JPL), Daniel J. McCleese (JPL), Michael S. Shumate (JPL), and Clay H. Seamen (JPL) Filed 3 Nov. 1978 13 p Sponsored by NASA
(NASA-Case-NPO-14524-1; NASA-Case-NPO-14527-1; US-Patent-Appl-SN-957452) Avail: NTIS HC A02/MF A01 CSCL 20F

A method and apparatus is disclosed for frequency modulating radiation, such as from a laser, for optoacoustic detectors, interferometers, heterodyne spectrometers, and similar devices using two oppositely reciprocating cat's-eye retro-reflectors to Doppler modulate the radiation. By reciprocally moving both retroreflectors, the center of mass is maintained constant to permit smooth operation at many Hertz. By slightly offsetting the axis of one retroreflector relative to the other, multiple passes a light beam may be achieved for greater Doppler shifts with the same reciprocating motion of the retroreflectors. A Doppler shift of 2(v/c) V sub 0 occurs for each pass. NASA

N80-21142*# Battelle Columbus Labs., Ohio.
ULTRAPURE GLASS OPTICAL WAVEGUIDE DEVELOPMENT IN MICROGRAVITY BY THE SOL-GEL PROCESS Final Progress Report, Mar. - Sep. 1979
Shyama P. Mukherjee 22 Feb. 1980 58 p refs Prepared for JPL
(Contract JPL-955361)
(NASA-CR-162910; JPL-9550-307) Avail: NTIS HC A04/MF A01 CSCL 20F

The alkali-borosilicate system was selected as the glass system for the preparation of ultrapure low loss glasses suitable for optical communication. The effect of different oxide contents on the absorption loss was critically reviewed. One composition was chosen to develop the gel preparation procedure in the alkali-borosilicate system. In addition, several procedures for the preparation of gels based on two different approaches were developed. The influence of different preparation parameters were investigated qualitatively. Several conclusions are drawn from the results. J.M.S.

N80-21143*# Virginia Univ., Charlottesville. School of Engineering and Applied Science.
INVESTIGATION OF DIRECT INTEGRATED OPTICS MODULATORS Annual Status Report, 1 Nov. 1978 - 30 Nov. 1979
T. E. Batchman Mar. 1980 69 p refs
(Contract NsG-1567)
(NASA-CR-162894; UVA/528171/EE80/102) Avail: NTIS HC A04/MF A01 CSCL 20F

Direct modulation techniques applicable to integrated optics data preprocessors were investigated. Several methods of modulating a coherent optical beam by interaction with an incoherent beam were studied. It was decided to investigate photon induced conductivity changes in thin semiconductor cladding layers on optical waveguides. Preliminary calculations indicate significant changes can be produced in the phase shift in a propagating wave when the conductivity is changed by ten percent or more. Experimental devices to verify these predicted phase changes and experiments designed to prove the concept are described. J.M.S.

N80-21144# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
DIRECTIONAL SELECTIVITY AND ITS USE IN EARLY VISUAL PROCESSING
D. Marr and S. Ullman Jun. 1979 64 p refs Sponsored in part by ARPA
(Contract N00014-75-C-0643; Grant NSF-MCS-77-07569)
(AD-A078054; AI-M-524) Avail: NTIS HC A03/MF A01 CSCL 05/8

The construction of directionally selective units, and their use in the processing of visual motion, are considered. The zero-crossings of Delta 2G(x,y)-I(x,y) are located, as in Marr Hildreth (1979). In addition, the time derivative d/dt Delta 2G(x,y)-I(x,y) is measured at the zero-crossings, and serves to constrain the local direction of motion to within 180 degrees. The direction of motion is determined in a second stage by combining the local constraints. The second part of the paper suggests a specific model of the information processing carried out by the X and Y cells of the retina and the LGN, and certain classes of cortical simple cells. A number of psychophysical and neurophysiological predictions are derived from the theory. GRA

N80-21145# Naval Research Lab., Washington, D. C. Electro-Optical Technology Program Office.
PASSIVE INFRARED SURVEILLANCE. PART 1: MODEL FORMULATION Interim Report
Richard A. Steinberg Sep. 1979 43 p refs
(AD-A075603; EOTPO-52; NRL-8320) Avail: NTIS HC A03/MF A01 CSCL 17/4

A new theoretical procedure is presented for calculating the performance of scanning background limited (BLIP) infrared sensors with adaptive threshold signal-processing logic. The performance predictions obtained with this model are background-conditional, i.e., are valid only for a given infrared background scene, presumably specified as a radiance map of arbitrary (but deterministic) structure. The nonstationary statistical nature of the photocurrent is explicitly taken into account. The basic approach involves a combination of some results from optical communications theory with a formalism for the threshold-crossing statistics of nonstationary noises. The present work is pursued further in a companion paper in which various simplifying approximations and illustrative numerical examples are presented. The theory developed in these two papers is directly applicable to design parameter trade-off studies for infrared search and track (IRST) devices. GRA

N80-21146# Army Aeromedical Research Unit, Fort Rucker, Ala. Human Tolerance and Survivability Div.
A DIRECT MEASURE OF CRT IMAGE QUALITY
Robert W. Verona, Harry L. Task, Victor C. Arnold, and James H. Brindle Sep. 1979 24 p refs Presented at the Soc. of Photo-Optical Instrumentation Engr. Intern. Symp., San Diego, Calif., 27 Aug. - 1 Sep. 1979
(DA Proj. 3A1-61101-A-91; DA Proj. 4E4-64207-D-425)
(AD-A075610; USAARL-79-14) Avail: NTIS HC A02/MF A01 CSCL 17/2

This paper describes a direct measuring technique for determining the image quality of raster-scanned cathode-ray tube (CRT) displays. This technique is based on the Modulation Transfer Function (MTF) theory and human visual psychophysical data. The rationale for the technique is discussed from a theoretical as well as functional viewpoint. The instrumentation necessary to obtain these measures in manual and automatic modes is discussed. Data obtained using this measurement technique are analyzed and compared with the theoretical performance of the displays. The image quality of new CRT displays procured for the U.S. Army's Advanced Attack Helicopter is being specified and tested using this direct measuring technique. GRA

N80-21147# Institute for Defense Analyses, Arlington, Va. Science and Technology Div.
EFFECT OF WEATHER AT HANNOVER, FEDERAL REPUBLIC OF GERMANY, ON PERFORMANCE OF ELECTROOPTICAL IMAGING SYSTEMS. PART 3: UNCERTAINTIES IN COMPARISON OF FLIR PERFORMANCE IN THE 3-5 AND 8-12 MICROMETERS BANDS Final Report
L. M. Biberman Sep. 1979 36 p refs
(Contract MDA903-79-C-0202)
(AD-A079574; AD-E500110; IDA-P-1128; IDA/HQ-75-17589) Avail: NTIS HC A03/MF A01 CSCL 17/5

This paper addresses aerosol contributions to the atmospheric problem, the uncertainties in predicting electrooptical system performance through the atmosphere in both the 3-5 and 8-12 micrometer bands because of uncertainties about aerosol composition and size distribution, and the effects of both aerosol composition and size distribution. GRA

N80-21148# Minnesota Univ., Duluth. Dept. of Physics.
OPTICAL DETECTION OF FIBER PARTICLES IN WATER Final Report, Mar. 1976 - Sep. 1978
S. R. Diehl, D. T. Smith, and M. Sydor Aug. 1979 73 p
(Grant EPA-R-804361)
(PB80-116866; EPA-600/2-79-127) Avail: NTIS HC A04/MF A01 CSCL 14B

Light scattering by individual particulates is used in a multiple-detector system to categorize the composition of suspended solids in terms of broad particulate categories. The scattering signatures of red clay and taconite tailings, the two primary particulate contaminants in western Lake Superior, along with two types of asbestiform fibers, amphibole, and chrysotile, were studied in detail. A method was developed to predict the concentration of asbestiform fibers in filtration plant samples for which electron microscope analysis was done concurrently. Fiber levels as low as 50,000 fibers/liter were optically detectable. The method offers a fast and inexpensive means for measuring, either on a continuous basis or as discrete samples, the fiber levels of filtration plant output. Further calibration of the instrument could enable analysis for other specific particulate contaminants as well. DOE

N80-20684# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
ADP-SUPPORTED COLOR SEPARATION
Hans Kern *In its* Rept. on Cartography and Topographical Meas. Ser. 2: Transl. 1978 p 55-64 (For primary document see N80-20679 11-42)
Avail: NTIS HC A07/MF A01

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N80-21149 Illinois Univ. at Chicago Circle, Chicago.
NONIDEAL COMPENSATION IN MHD GENERATORS Ph.D. Thesis
David A. Carl 1979 274 p
Avail: Univ. Microfilms Order No. 8009457

Nonideal compensation, the distortion of the total magnetic flux density by the induced magnetic flux density despite the presence of compensating bus bars, was examined with one and two dimensional models. The conducting fluid was assumed to be an incompressible liquid at a constant velocity. The iterative solution technique used in both models consisted of iterating between an equivalent circuit model that solves for the air gap current distribution, given the total magnetic flux density distribution, and a magnetic field model that solves for the total magnetic flux density distribution, given the air gap current distribution. End loss was modeled by a shunt resistance. The one dimensional model was intended to indicate general trends. The two dimensional model was intended to provide a more detailed analysis. Dissert. Abstr.

N80-21150 Stanford Univ., Calif.
COLLISIONAL EFFECTS ON ELECTROSTATIC WAVES IN ISOTROPIC PLASMAS Ph.D. Thesis
Ronald Wilensky 1979 183 p
Avail: Univ. Microfilms Order No. 8006369

The effect of electron neutral collisions on electrostatic wave propagation in an isotropic Lorentz plasma was investigated. The linearized Boltzmann equation was solved assuming the neutrals are stationary and infinitely heavy. Electron-neutral scattering is described by an arbitrary scattering cross section. For a small sinusoidal perturbation of the plasma, the resultant electron velocity distribution is the sum of an arbitrary isotropic distribution plus an incremental function represented by an infinite continued fraction containing all the Allis transport collision frequencies. From this distribution, a dispersion relation for electrostatic wave propagation was derived. Solutions of this relation are found for

three representative collision processes (constant mean free path, constant mean free time, and Ramsauer scattering) for both Maxwellian and nonMaxwellian equilibrium electron velocity distributions.

N80-21151 Wisconsin Univ. - Madison.
DIVERTOR EXPERIMENTS IN A TOROIDAL PLASMA, WITH ExB DRIFT DUE TO AN APPLIED RADIAL ELECTRIC FIELD Ph.D. Thesis
Edward Jonathan Strait 1979 244 p
Avail: Univ. Microfilms Order No. 8004746

The ExB drift arising from an externally applied electric field was examined for application in a Tokamak or other toroidal magnetic plasma confinement device to remove plasma and impurities from the region near the wall and reduce the amount of plasma striking the wall. Among the possible advantages of this scheme are easy external control over the rate of removal of plasma, more rapid removal than the naturally occuring rate in a magnetic divertor, and simplification of construction if the magnetic divertor is eliminated. Results of several related experiments performed in a levitated octupole are presented. A model based on the plasma's perpendicular dielectric constant and perpendicular conductivity is described which suggests that such an electric field applied perpendicular to the magnetic field will be inversely proportional to plasma density, allowing the electric field to penetrate the plasma on the scale length of the density profile. Dissert. Abstr.

N80-21152 Wisconsin Univ. - Madison.
STABILITY ANALYSIS OF CYLINDRICAL VLASOV EQUILIBRIA Ph.D. Thesis
Robert Wesley Short 1979 204 p
Avail: Univ. Microfilms Order No. 8001628

A method is presented for the stability analysis of cylindrically symmetric collisionless plasmas. The method is applied to any such plasma which is described by the Vlasov-Poisson or Vlasov-Maxwell equations. The plasma and field equations are linearized and Fourier analyzed in the ignorable coordinates theta and zeta. The coordinates of the particle trajectories in phase space are represented as Fourier series in time and the perturbed distribution function is obtained by integration over unperturbed orbits. The method is first presented for the Vlasov-Poisson equations, and demonstrated by a calculation of the lower hybrid drift instability in a plasma with a rigid rotor distribution function. The method is then extended to the fully electromagnetic case and applied to a relativistic E layer interacting with a warm background plasma. Dissert. Abstr.

N80-21153 Missouri Univ. - Columbia.
BACKSCATTERING OF ELECTROMAGNETIC WAVES FROM ELECTROSTATIC WAVES IN A MAGNETIZED PLASMA Ph.D. Thesis
Sinan Kadri Bilikmen 1979 126 p
Avail: Univ. Microfilms Order No. 8007130

Stimulated backscattering which arises from the parametric decay of an intense electromagnetic wave into an electrostatic wave and a backscattered electromagnetic wave was investigated. The analysis was facilitated by derivation of a pair of coupled differential equations for the amplitudes of the backscattered and scatterer waves by using Maxwell's equations and two fluid equations for homogeneous, inhomogeneous, bounded and unbounded magnetized plasmas. The backscattering of an intense electromagnetic wave was examined, while propagating in the ordinary mode along a number density gradient and perpendicular to a uniform static magnetic field. The stimulated backscattering of electromagnetic waves from extraordinary waves propagating normal to a magnetic field in a plasma of finite length was also studied. Dissert. Abstr.

N80-21154# Nagoya Univ. (Japan). Inst. of Plasma Physics.
PROCEEDINGS OF USSR-JAPAN JOINT SEMINAR ON PLASMA DIAGNOSTICS
O. Pavlichenko and J. Fujita Jan. 1980 228 p refs Proc. held at Nagoya, Japan, 13-17 Nov. 1979
(IPPJ-438) Avail: NTIS HC A11/MF A01

The development of high temperature plasma diagnostics suitable for nuclear fusion research is discussed with emphasis on diagnostics for the large JT-60 and T-15 Tokamaks. Recent results on the KhTI, the T-15, the JIPP T-2 stellarator/tokamak, the TORUIT-4, the TRIAM-1, and the DIVA/JFT-2a are reported. Topics covered include measuring nonstationary and anisotropic density fluctuations using electromagnetic wave scattering, the development of a twin optically-pumped far infrared CH3OH laser; SMM wave laser scattering apparatus for measuring waves and turbulences in Tokamak plasmas; the role of impurity spectra in tokamak devices; diagnosing dense plasmas with ruby laser holography; heavy ion beam probes for potential measurement; supersound plasma counter-streaming interaction and thermalization inside open magnetic traps; and the collision of high energy plasma streams. A.R.H.

N80-21155# Nagoya Univ. (Japan). Inst. of Plasma Physics.
STEADY MOTIONS EXHIBITED BY DUFFING'S EQUATION: A PICTURE BOOK OF REGULAR AND CHAOTIC MOTIONS
Yoshisuke Ueda (Kyoto Univ., Japan) Jan. 1980 14 p refs Presented at the Eng. Foundation Conf. on New Approaches to Nonlinear Problems in Dyn., Monterey, Calif., 9-14 Dec. 1979
(IPPJ-434) Avail: NTIS HC A02/MF A01

Various types of steady states take place in the system exhibited by Duffing's equation. Among them harmonic, higher harmonic and subharmonic motions are popularly known. Then ultrasubharmonic motions of different orders are fairly known. However chaotic motions are scarcely known. Analog and digital computers are used to survey of the whole aspect of steady motions exhibited by Duffing's equation. Author

N80-21156# Nagoya Univ. (Japan). Inst. of Plasma Physics.
DEFLAGRATION WAVE FORMED BY ION BEAM. PART 3: WITH ENERGY OF DIRECT FUSION REACTION
Keishiro Niu, Takashi Abe, and Moritake Tamba Jan. 1980 15 p refs
(IPPJ-435-Pt-3) Avail: NTIS HC A02/MF A01

The structure of the deflagration wave which is formed in a target bombarded by an ion beam was analyzed. Stationary deflagration and/or detonation waves are formed at the surface of the target in a case in which the reaction energy of direct fusion and/or the beam energy deposited in the target are less than a critical value. On the other hand, no solution for stationary wave exists, if the energy deposited in the wave exceeds a critical value. In the latter case, the time-dependent fundamental equations reduce approximately to a self-similar type of equations. Numerical integrations are carried out for this type of differential equations, and an example of self-similar deflagration wave numerically obtained is plotted in the figures. A.R.H.

N80-21157# Nagoya Univ. (Japan). Inst. of Plasma Physics.
NUMERICAL STUDY OF CURRENT-DRIVEN COLLISIONAL DRIFT AND ALFVEN INSTABILITIES IN A SHEARED MAGNETIC FIELD
Ken-ichi Nishikawa Jan. 1980 34 p refs
(IPPJ-436) Avail: NTIS HC A03/MF A01

A set of coupled eigenmode equations for drift and shear Alfven mode in a sheared magnetic field is solved numerically including effects of parallel current, the full ion dynamics and electron-ion collisions. Detailed studies are made on the eigenmode structures of both the modes and combined effects of current and finite-beta. An outstanding result is that the current-driven drift mode shows, at some moderate beta value, a peculiarity in dispersion and its eigenmode structure is deformed to a shape different from the usual one, which means the strong coupling of drift mode to shear Alfven mode due to the combined effects. In the most cases except this, the effects of finite-beta and collisions are found to be stabilizing. A.R.H.

N80-21158# Nagoya Univ. (Japan). Inst. of Plasma Physics.
HIGH POWER ION-IRRADIATION TEST FOR CTR FIRST WALL
A. Mohri, K. Narihara, Y. Tomita, T. Tsuzuki, Z. Kabeya, K. Akaishi, and A. Miyahara Jan. 1980 12 p refs
(IPPJ-437) Avail: NTIS HC A02/MF A01

High power irradiation of ions on metal surface can be obtained by using plasma anode for electron beam generation. The irradiation power of 600 keV protons was 50 MW/sq cm which is comparable with pulse power loading of CTR Tokamak first wall at a strong major disruption. Damage of 304 stainless

steel by this irradiation was different from by usual irradiation of ions at low power level. A.R.H.

N80-21159*# Science Applications, Inc., McLean, Va.
STRONGLY TURBULENT STABILIZATION OF ELECTRON BEAM-PLASMA INTERACTIONS Interim Report
H. P. Freund, I. Haber, P. Palmadesso, and K. Papadopoulos 9 Nov. 1979 43 p
(NASA Order W-14365)
(NASA-CR-162843; AD-A078231; AD-E000340; NRL-MR-4127) Avail: NTIS HC A03/MF A01 CSCL 20/9

The stabilization of electron beam interactions due to strongly turbulent nonlinearities is studied analytically and numerically for a wide range of plasma parameters. A fluid mode coupling code is described in which the effects of electron and ion Landau damping and linear growth due to the energetic electron beam are included in a phenomenological manner. Stabilization of the instability is found to occur when the amplitudes of the unstable modes exceed the threshold of the oscillating two stream instability. The coordinate space structure of the turbulent spectrum which results clearly shows that soliton-like structures are formed by this process. Phenomenological models of both the initial stabilization and the asymptotic states are developed. Scaling laws between the beam-plasma growth rate and the fluctuations in the fields and plasma density are found in both cases, and shown to be in good agreement with the results of the simulation. GRA

N80-21160# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.
DEVELOPMENT, TESTING AND EVALUATION OF MHD MATERIALS AND COMPONENTS DESIGNS Quarterly Report, Jul. - Sep. 1978
John W. Sadler, J. Bein, and D. L. Black Dec. 1978 94 p refs
(Contract EX-76-C-01-2248)
(FE-2248-22) Avail: NTIS HC A05/MF A01

Laboratory screening tests, including electrochemical corrosion and anode arc erosion tests, are reported. Results of electrochemical tests are presented which imply that for MHD channels operating under liquid slagging wall conditions the deleterious reactions with slag, presently recognized as limiting channel operation, metallic Fe formation at the cathode, and O2 gas release and cavitation at the anode, can be prevented with the use of ionic oxide electrodes. Initial results of investigations of arc impingement damage to selected metallic anode materials over the temperature range of 185 C to 650 C are presented. DOE

N80-21161# California Univ., Livermore. Lawrence Livermore Lab.
FORMATION OF TOROIDAL PLASMA CONFINEMENT CONFIGURATONS BY USING HOT ELECTRONS
C. W. Hartman 9 Aug. 1979 15 p refs
(Contract W-7405-eng-48)
(UCID-18239) Avail: NTIS HC A02/MF A01

Two means for producing closed, toroidal pinch like configurations with hot electrons starting from a microwaves heated, hot electron plasma confined in open fields are described. The final configurations are directly related to Spheromak and Tormac. DOE

N80-21162# Wisconsin Univ. - Madison. Dept. of Physics.
VACUUM ULTRAVIOLET SPECTROSCOPIC STUDY OF PLASMA IMPURITIES IN THE TOKAPOLE 2 POLOIDAL DIVERTOR EXPERIMENT Ph.D. Thesis
R. J. Groebner May 1979 231 p refs
(Contract EY-76-S-02-2387)
(COO-2387-111) Avail: NTIS HC A11/MF A01

The main diagnostics were two vacuum ultraviolet spectrometers, which were used to identify impurities, observe impurity behavior, and measure the line radiated power in tokapole 2, a Tokamak with a four node poloidal diverter. Impurity concentrations and the effects of impurities on gross plasma characteristics were determined with an impurity doping technique. The electron temperature was estimated by a time dependent coronal model describing the time history of the oxygen ions. The ion temperature was obtained from Doppler broadening measurements. Energy loss processes were studied with a power balance analysis. DOE

N80-21163# Exxon Research and Engineering Co., Linden, N.J.
MATERIAL IMPLICATIONS OF DESIGN AND SYSTEM STUDIES FOR INERTIAL CONFINEMENT FUSION SYSTEMS
J. A. Maniscalco and W. R. Meier Dec. 1978 9 p ref Presented at the Topical Meeting on Fusion Reactor Mater., Miami Beach, Fla. 29 Jan. 1979 Prepared in cooperation with Lawrence Livermore Lab., Calif.
(Contract W-7405-eng-48)
(UCRL-82041; CONF-790125-82) Avail: NTIS HC A02/MF A01

The material requirements for inertial confinement fusion (ICF) reactors are presented. The requirements are defined and analyzed by describing the environment created from the process of generating energy with ICF, and then analyzing the ICF reactor concepts which were designed to cope with this hostile environment. DOE

N80-21164# Princeton Univ., N. J.
TECHNIQUES FOR MEASURING THE ALPHA-PARTICLE DISTRIBUTION IN MAGNETICALLY CONFINED PLASMAS
D. E. Post, D. R. Mikkelsen, R. A. Hulse, L. D. Stewart, and J. C. Weisheit Oct. 1979 53 p refs
(Contract EY-76-C-02-3073)
(PPPL-1592) Avail: NTIS HC A04/MF A01

Methods are proposed for measuring the alpha particle distribution in magnetically confined fusion plasma using neutral atom doping beams, ultraviolet spectroscopy, and neutral particle detectors. In the first method, single charge exchange reactions are used to populate the $n=2$ and $n=3$ levels of $He(+)$. The ultraviolet photons from the decaying excited states are Doppler shifted by 5 to 10 Angstroms from those produced by the thermalized alpha particle ash. In the second method double charge exchange reactions enable fast neutralized alpha particles to escape from the plasma and be detected by neutral particle analyzers. Detector configurations are analyzed, count rates are estimated, and their detectability is discussed. A preliminary analysis of the feasibility of the required neutral beams is presented, and exploratory experiments on esisting devices are suggested. DOE

N80-21165# Department of Energy, Washington, D. C. Office of Fusion Energy
FUSION TECHNOLOGY DEVELOPMENT
Aug. 1979 151 p refs
(DOE/ET-0116/1) Avail: NTIS HC A08/MF A01

Conceptual design studies of fusion energy and fusion reactos are presented. The magnetics of fusion reactors are discussed with an overview of a large coil program included. Plasma heating, fueling, and exhaust systems for the reactors are described and research on materials for fusion reactors is discussed. A.W.H.

N80-21166# Argonne National Lab., Ill.
ADVANCES IN MHD TECHNOLOGY
M. Petrick, R. V. Shanklin, III (DOE, Washington, D.C.), and G. Rudins (DOE, Washington, D.C.) 1979 52 p refs Presented at the Advances in Coal Util. Symp., Louisville, Ky., 14-15 May 1979
(Contract W-31-109-eng-38)
(CONF-790598-5) Avail: NTIS HC A04/MF A01

The operation of magnetohydrodynamic (MHD) generators is discussed. The thermodynamic and economic potential, the technical status and recent advances, and the environmental issues associated with MHD power plants are examined. A national program for developing MHD conversion is described and experimental MHD generator operations in the U.S. and U.S.S.R. are reported. A.W.H.

N80-21167# Oak Ridge Y-12 Plant, Tenn.
VELOCITY SPACE INSTABILITIES OF ALPHA PARTICLES IN TOKAMAK REACTORS
D. J. Sigmar 1979 16 p refs Presented at Course and Workshop on Phys. of Plasmas near Thermonucl. Conditions, Varenna, Italy, 27 Aug. - 7 Sep. 1979
(Contract W-7405-eng-26)

(DOE/TIC-11016) Avail: NTIS HC A02/MF A01

The conditions for the linear theory and the anomalous relaxation of the velocity space instability of isotropic alpha distribution functions are discussed. Mathematical models show that such distributions actually arise under thermonuclear conditions in a Tokamak reactor, particularly for the case of imperfect alpha particle confinement. The toroidal geometry of the problem is described and the derivations which display the linear instability of the compressional plasma waves are presented. A.W.H.

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

N80-21168 British Library Lending Div., Boston Spa (England).
MATHEMATICAL MODELS OF SOME CONTROLLED CRYSTALLIZATION PROCESS
A. Gosiewski and M. Niezgodka Oct. 1979 19 p refs Transl. into ENGLISH from Arch. Automatykii Telemechaniki (Poland), v. 23, no. 3, 1978 p 255-265
(BLL-RTS-12032) Avail: British Library Lending Div., Boston Spa, Engl.

The process of controlled crystal growth from a binary melt is examined. A mathematical model of this process is formulated in the form of a system of two phase parabolic boundary problems with free interface relating to the temperature and concentration fields. The boundary conditions are used as process control variables. An integral equivalent representation of the model is presented. A control problem whose objective is to achieve the desired dynamic properties of the phase change interface and to attain a fixed terminal state is described. A.W.H.

N80-21169 Cornell Univ., Ithaca, N. Y.
LOAD RELAXATION AND TRANSMISSION ELECTRON MICROSCOPY STUDIES OF GERMANIUM Ph.D. Thesis
Shin-Wu Chiang 1979 165 p
Avail: Univ. Microfilms Order No. 8003907

The log sigma - log xi data obtained from load relaxation experiments on Ge single crystals are analyzed using a rheological model. A systematic transition from concave upward to concave downward curvature occurs with increasing temperature, corresponding to a transition from glide controlled to climb/cross-slip controlled deformation. Also faulted dipoles ranging in height from 3 to 12 nm in deformed weak beam transmission electron microscopy techniques. Only intrinsic, Z-shape faulted dipoles are observed. Lattice fringe images of large faulted dipoles yield stacking fault energy of 78 + or - 7 sq/mJm. As determined from the height and width of faulted dipoles viewed end-on in lattice fringe images, the value for the stacking fault calculated from anisotropic elasticity theory increases from 78 to 160 sq/mJm as the height decreases from 5 to 3 nm.
Dissert. Abstr.

N80-21170 Maryland Univ., College Park.
EFFECTS OF SURFACE STRUCTURE ON SECONDARY ELECTRON EMISSION Ph.D. Thesis
Marten Leendert DenBoer 1979 72 p
Avail: Univ. Microfilms Order No. 8006757

The strong indications of low energy electrons with most materials has led to their widespread use as a probe of the surface region. Perhaps the simplest experiment utilizing electrons is to measure the total secondary yield as a function on incident electron energy. Although such a plot appears smooth, there are many small, but relatively abrupt inflections that can be enhanced by differentation with respect to incident electron energy. In particular, sudden increases in yield are associated with the thresholds for the excitation of core states, i.e., the so-called appearance potentials. To clarify the mechanism for this effect, the energy distribution of electrons contributing to these features was analyzed. It is found that at threshold, while the elastic yield decreases due to the opening of a new inelastic channel, the total yield in general increases because of the inelastic scattering of electrons from Auger recombination of the created core holes. This produces a shower of low energy electrons which are responsible for most of the increase in yield.
Dissert. Abstr.

N80-21171 Pennsylvania State Univ., University Park.
STUDY OF RAMAN LINEWIDTHS AS A FUNCTION OF STRUCTURE, BONDING AND TEMPERATURE Ph.D. Thesis
Regis Joseph Betsch 1979 174 p
Avail: Univ. Microfilms Order No. 8005977

The anomalous Raman line broadening in crystalline materials was studied. To differentiate between the various sources of line broadening, an empirical model of the Raman scattering process was developed. The digitized Raman spectra were analyzed using smoothing and curve fitting routines developed on an IBM 370/168 computer. The capabilities of the automated system and the analysis software were examined using the Raman spectrum of diamond. The materials studied which exhibit anomalous linewidth behavior were: LaB6, rutile (TiO2), and sillenite (Bi12GeO20). Dissert. Abstr.

N80-21172 Stanford Univ., Calif.
PHASE TRANSITIONS IN LATTICE GAUGE THEORIES Ph.D. Thesis
Eduardo Hector Fradkin 1979 231 p
Avail: Univ. Microfilms Order No. 8006311

The phase structure of gauge theories on a lattice are discussed. The analogies between four dimensional gauge theories and two dimensional magnetic systems are analyzed. An analogy between the two dimensional Planar ferromagnet and the four dimensional Abelian gauge theory is discussed. The behavior of gauge theories with dynamical matter (Higgs) fields is examined. The role of local (gauge) symmetries in random magnetic systems is discussed. Dissert. Abstr.

N80-21173# Stanford Linear Accelerator Center, Calif.
PARITY NONCONSERVATION IN POLARIZED ELECTRON SCATTERING AT HIGH ENERGIES
C. Y. Prescott Oct. 1979 15 p refs Presented at the Intern. Workshop on Neutral Current Interactions in Atoms, Cargese, Corsica, 10-15 Sep. 1979
(Contract EY-76-C-03-0515)
(SLAC-Pub-2409) Avail: NTIS HC A02/MF A01

Observations of parity violation in inelastic scattering of electrons at high energy are discussed. The kinetics of the process, the idealized case of scattering from free quark targets, experimental techniques and results, and relations to atomic physics of parity violation in bismuth and thallium atoms are analyzed. DOE

N80-21174# Illinois Univ., Urbana. Dept. of Physics.
STUDIES IN THE ELECTRONIC STRUCTURE OF MATTER Ph.D. Thesis
C. A. Swarts 1979 350 p refs
(Contract EY-76-C-02-1198)
(COO-1198-1268) Avail: NTIS HC A15/MF A01

The results of various theories for the angular distribution of electrons photoemitted from the outermost p shell of rare gas atoms are compared. The theories compared are the local density theories of Slater and of Hohenberg, Kohn and Sham, the pseudopotential method, Hartree-Fock theory, and random phase approximation with exchange. Extended Huekel theory is applied to GaAs, GaP, and to the nitrogen isoelectronic trap in GaAs and GaP. The computer perfect crystal band structures are found to be in reasonable agreement with those computed with empirical pseudopotentials. Nitrogen impurity levels in GaAs and GaP are calculated using a cluster model. By means of model calculations for an independent electron metal, exact lineshapes are obtained for the photon absorption, emission and photoemission spectra of deep core states. DOE

N80-21175# Los Alamos Scientific Lab., N. Mex.
ROLES OF CRYSTAL FIELDS IN MAGNETIC SUPERCONDUCTING RARE-EARTH RHODIUM BORIDES
S. Maekawa (Tohoku Univ.) and C. Y. Huang 1979 9 p refs Presented at the Intern. Conf. on Crystalline Elec. Field and Structural Effects in F-Electron Systems, Philadelphia, 12 Nov. 1979
(Contract W-7405-eng-36)

(LA-UR-79-3174; CONF-791142-3) Avail: NTIS HC A02/MF A01

The structural effects of the tetragonal crystal field of rare earth ions on both magnetic and superconducting properties of RRh4B4 are discussed. Special attention is paid to RRh4B4, with R = Ho, Er, and Tm, and the pseudoternaries Er/sub 1-x/Ho/sub x/Rh4B4 and Er/sub 1-x/ Tm/sub x/Rh4B4. The lowest crystalline anisotropy field is described. DOE

N80-21176# Los Alamos Scientific Lab., N. Mex.
GROUND STATES AND MAGNETIC RESPONSES OF MODEL VALENCE-FLUCTUATION SYSTEMS
B. H. Brandow 1979 9 p refs Presented at Intern. Conf. on Crystalline Elec. Field and Structural Effects in F-Electron Systems, Philadelphia, 12-15 Nov. 1979
(Contract W-7405-eng-36)
(LA-UR-79-3144; CONF-791142-4) Avail: NTIS HC A02/MF A01

Variational ground state wavefunctions are presented and optimized for two model valence-fluctuation systems based on Anderson lattice Hamiltonians in the U approaches infinity limit. Although these wavefunctions are approximate, they are treated in an essentially exact manner. The response of the ground state to a magnetic field is discussed. DOE

N80-21177# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
MOLECULAR BEAM PHOTOIONIZATION AND GAS-SURFACE SCATTERING Ph.D. Thesis
S. T. Ceyer Sep. 1979 244 p refs
(Contract W-7405-eng-48)
(LBL-9838) Avail: NTIS HC A11/MF A01

The energetics of the ethylene ion-molecule reactions was investigated. The energetics of the solvated ethlyene dimer ion was investigated by the photoionization of the ethylene trimer. The absolute proton affinity of NH3 and the proton solvation energies by more than one NH3 were determined by molecular beam photoionization. In addition, the NH3(+) - NH3 interaction energy was measured by photoionization of the neutral van der Waals dimer. The scattering of helium atomic beams from a high Miller index platinum surface that exhibits ordered, periodic steps on the atomic scale to probe the effect of atomic steps on the scattering distribution is explored. The design, construction and operation of a beam surface scattering apparatus are described. DOE

N80-21178# Stanford Linear Accelerator Center, Calif.
PARITY VIOLATION IN DEEP INELASTIC ELECTRON SCATTERING
R. E. Taylor Nov. 1979 16 p refs Presented at the Intern. Conf. on Nucl. Phys. with Electromagnetic Interaction, Maine, 5-9 Jun. 1979
(Contract EY-76-C-03-0515)
(SLAC-Pub-2432; CONF-790610-6) Avail: NTIS HC A02/MF A01

Neutral currents in electron scattering and the Weinberg-Salam model are reviewed. Results from neutrino interactions and deep inelastic electron scattering experiments are discussed. The SLAC-Yale experiment which measured a difference in the e-d inelastic cross section for right- and left-handed electrons is described. The polarized source, beam monitors, scattering experiment, checks of helicity dependence, and results are discussed. DOE

N80-21179# Argonne National Lab., Ill. Materials Science Div.
ENERGY OF < 100 > COINCIDENCE TWIST BOUNDARIES IN TRANSITION METAL OXIDES
D. Wolf 1979 14 p refs Presented at the 3rd Europhys. Topical Conf. on Lattice Defects in Ionic Crystals, Canterbury, England, 17 Sep. 1979
(Contract W-31-109-eng-38)
(CONF-7907101-2) Avail: NTIS HC A02/MF A01

The energies of coincidence twist boundaries formed by rotation about a < 100 > axis in stoichiometric transition metal oxides crystallizing in the NaCl structure (such as NiO, MnO, and CoO) were calculated using the ionic type potentials for these materials. From a relaxation calculation it is found that the energies of the most prominent coincidence twist boundaries at 36.87, 22.62, 28.07, and 16.26 deg lie above the energy of the free /100/ surface. DOE

N80-21180# Cornell Univ., Ithaca, N. Y. Dept. of Materials Science and Engineering.
MECHANICAL PROPERTIES OF CRYSTALLINE SOLIDS Progress Report, 1 Dec. 1978 - 30 Nov. 1979
Che Yu Li and E. W. Hart 1 Sep. 1979 60 p refs
(Contract EY-76-S-02-2172)
(COO-2172-29) Avail: NTIS HC A04/MF A01

Transient deformation, grain boundary sliding, and grain boundary cavitation processes in the Zircaloys were investigated. A second generation deformation model based on state variables, which represents transient deformation, was experimentally verified. Experimental capabilities for investigating grain boundary anelasticity were developed along with unified phenomenological models for grain boundary anelasticity and grain boundary sliding. Theoretical modeling of stress relaxation in thin films was included. DOE

N80-21181# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany). Abt. Atom- und Molkuel physik.
MEASUREMENTS AND CALCULATIONS OF ELECTRONIC EXCITATION FROM COLLISIONS BETWEEN ATOMS OF ALKALIS AND MERCURY IN THE ENERGY RANGE 10 eV TO 1400 eV [MESSUNG UND BERECHUNG INTEGRALER ELEKTRONISCHER ANREGUNGSQUERSCHNITTE FUER ALKALI-QUECKSILBER-STOSSSYSTEME IM ENERGIEBEREICH ZWISCHEN 10 UND 1400 eV]
Gebhard Moritz Nov. 1978 151 p refs In GERMAN
(MPIS-24/1978) Avail: NTIS HC A08/MF A01; Max-Planck Inst. fuer Stroemungsforsch., Goettingen, West Germany DM 27.15

Exchanges between the alkali metals Na, K, Cs, Rb, and Hg were studied by measuring the radiation emitted in a dispersion chamber when the alkali beam interacts with the mercury atoms. Spectrum analysis and intensity measurements show that the dominant factor is the scattering of the lowest resonance level of the alkali. Application of quantum mechanics (with the solution of the Schroedinger equations) gave exact solutions in the low energy domain. Author (ESA)

N80-21182# Laboratoires d'Electronique et de Physique Appliquee, Limeil-Brevannes (France).
COMPENSATION MECHANISMS IN GaAs. STUDY OF CHROME AND OXYGEN IN THIS MATERIAL AND THEIR INFLUENCE IN OBTAINING SEMI-INSULATING GaAs Final Report [PHENOMENES DE COMPENSATION DANS GAAS. ETUDE DU CHROME ET DE L'OXYGENE DANS CE MATERIAU ET CONSEQUENCES POUR L'OBTENTION DE GAAS SEMI-ISOLANT]
G. M. Martin, A. Mitonneau, A. Mircea-Roussel, A. Mircea, J. P. Farges, G. Jacob, J. P. Hallais, and G. Poiblaud Jun. 1979 85 p refs In ENGLISH and FRENCH
(Contract DGRST-77-7-0085)
(LEP-79/640.SME-645-C) Avail: NTIS HC A05/MF A01

Crystal ingots of doped GaAs were characterized using electrical and optical techniques in order to study the deep compensation mechanisms responsible for the materials semi-insulating qualities. The crystals were doped with varying amounts of oxygen and chromium. Hall effect measurements and results from optical transient current spectroscopic analysis were compared with diverse chemical analyses. The relationship of doping concentration on electron mobility in deep crystal layers and the electrical properties of this type of semiconductor material are discussed. Author (ESA)

N80-21183# National Bureau of Standards, Washington, D.C. National Measurement Lab.
STANDARD X-RAY DIFFRACTION POWDER PATTERNS. SECTION 16: DATA FOR 86 SUBSTANCES Final Report
Marlene C. Morris, Howard F. McMurdie, Eloise H. Evans, Boris Paretzkin (Joint Committee on Powder Diffraction Standards, Swarthmore, Pa.), Johan H. deGroot (Joint Committee on Powder Diffraction Standards, Swarthmore, Pa.), Camden R. Hubbard (Joint Committee Powder Diffraction Standards, Swarthmore, Pa.), and Simon J. Carmel Oct. 1979 190 p refs Prepared in

cooperation with Joint Committee on Power Diffraction Standards, Swarthmore, Pa.
(PB80-110364; NBS-MONO-25-SECT-16; LC-53-61386) Avail: NTIS HC A09/MF A01 CSCL 20B

Standard X-ray diffraction patterns are presented for 86 substances. Fifty-eight of these patterns represent experimental data and 28 are calculated. The experimental X-ray powder diffraction patterns were obtained with an X-ray diffractometer. All of values were assigned Miller indices determined by comparison with computed interplanar spacings consistent with space group extinctions. The densities and lattice constants were calculated and the refractive indices were measured whenever possible. The calculated X-ray powder diffraction patterns were computed from published crystal structure data. Both peak height and integrated intensities are reported for the calculated patterns. GRA

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

N80-21184 Oregon Univ., Eugene.
ACCELERATING PARTICLES IN GENERAL RELATIVITY (STATIONARY C-METRIC) Ph.D. Thesis
Hamid Farhoosh 1979 133 p
Avail: Univ. Microfilms Order No. 8005762

The physical and geometrical properties of uniformly accelerating particles in the general theory of relativity are examined. The structure of the Killing horizons in the static vacuum C-metric which represents the gravitational field of a uniformly accelerating Schwarzschild like particle (nonrotating and spherically symmetric) is studied. It is shown that for $A(2)m(2) < 1/27$ there exist two physically meaningful Killing horizons. The results are generalized to include the effects of the rotation of the source. For small acceleration and small rotation, the solution reveals the existence of three Killing horizons. The radial geodesic and nongeodesic motions in the static vacuum C-metric (nonrotating case) are also investigated. Finally, the radiative behavior of the stationary charged C-metric representing the electrogravitational field of uniformly accelerating and rotating charged particle with magnetic monopole and the NUT-parameter are investigated. Dissert. Abstr.

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N80-21185# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
PLANNING AND CONTROL OF RESEARCH AND DEVELOPMENT PROJECTS WITH CONTRIBUTIONS FROM SPACE TECHNOLOGY [PLANUNG UND UEBERWACHUNG VON FORSCHUNGS- UND ENTWICKLUNGSPROJEKTEN]
Bernd J. Madauss Nov. 1978 311 p refs Partly in GERMAN and ENGLISH
Avail: NTIS HC A14/MF A01

The principal planning and control methods are elaborated to include technical and engineering tasks, financial and personnel management. General rules are given which have come from not only the space program, but from management of such large engineering projects as the Caracas subway system. Annexes contain examples of forms and flow charts used as tools in such projects. Author (ESA)

N80-21186# General Technology Systems Ltd., London (England).
STUDY AND IMPLEMENTATION OF AN ESA COMPUTERIZED PLANNING SYSTEM, PHASE 1. VOLUME 2: DATA FILES AND UPDATING
P. Brunt, G. E. Hall, and L. W. Steines Jan. 1978 173 p 6 Vol.
(Contract ESA-3172/77-F-WMT)
(GTS-760972-Vol-2; ESA-CR(P)-1222-Vol-2) Avail: NTIS HC A08/MF A01

A computerized system which simulates the planning activities, formalizes the decision making process, and aids management information retrieval for the European Space Agency is described. It is indicated that the system permits the analysis of statistical cost data; the manipulation of price levels, currencies and cost elements, the prediction of national space expenditure capabilities and of the margin available for new projects, the selection and 'fitting' of projects into the margin, and the comparison of manpower requirements with forecast industrial capacity. Raw data files are provided as well as instructions for updating. Author (ESA)

N80-21187# General Technology Systems Ltd., London (England).
STUDY AND IMPLEMENTATION OF AN ESA COMPUTERIZED PLANNING SYSTEM, PHASE 2. VOLUME 4: UPDATING OF SUBPROGRAMS ESA 1-5
G. E. Hall, L. W. Steines, and P. Brunt Oct. 1978 82 p 6 Vol.
(Contract ESA-3172/77-F-WMY(SC))
(GTS-760972-Vol-4; ESA-CR(P)-1222-Vol-4) Avail: NTIS HC A05/MF A01

A computerized system has been defined and implemented which simulates the planning activities, formalizes the decision making process and aids mangement information retrieval for the European Space Agency. Five subprogram blocks permit the analysis of statistical cost data, the manipulation of price levels, currencies and cost elements, the prediction of national space expenditure capabilities and of the margin available for new projects; the selection and fitting of projects into the margin, and the comparison of manpower requirements with forecast industrial capacity. The detailed activities necessary for updating the planning system subprograms are given. Author (ESA)

N80-21188# General Technology Systems Ltd., London (England).
STUDY AND IMPLEMENTATION OF AN ESA COMPUTERIZED PLANNING SYSTEM, PHASE 2. VOLUME 5: PROJECT RETURNS AND BENEFITS
P. Brunt, G. E. Hall, and W. Spiess Dec. 1978 154 p 6 Vol.
(Contract ESA-3172/77-F-WMT)
(GTS-760972-Vol-5; ESA-CR(P)-1222-Vol-5) Avail: NTIS HC A08/MF A01

A computerized system was defined and implemented which simulates the planning activities, formalizes, the decision making process, and aids management information retrieval for the European Space Agency. Five subprogram blocks permit the analysis of statistical cost data; the manipulation of price levels, currencies and cost elements; the prediction of national space expenditure capabilities and of the margin available for new projects; the selection and 'fitting' of projects into the margin; and the comparison of manpower requirements with forecast industrial capacity. The definition and programming of the segment of the program dealing with the evaluation of project returns and benefits are presented. The functions foreseen for the program in use, program structure, coding instructions, and description of subprograms are included. Author (ESA)

N80-21189# General Technology Systems Ltd., London (England).

STUDY AND IMPLEMENTATION OF AN ESA COMPUTERIZED PLANNING SYSTEM. EXECUTIVE SUMMARY
P. Brunt and G. E. Hall Oct. 1978 32 p 6 Vol.
(Contract ESA-3172/77-F-WMT)
(GTS-780972-Vol-6; ESA-CR(P)-1222-Vol-6) Avail: NTIS HC A03/MF A01

A computerized system was defined and implemented which simulates the planning activities, formalizes the decision making process, and aids management information retrieval for the European Space Agency. Subprogram blocks which permit the analysis of statistical cost data, the manipulation of price levels, currencies and cost elements, the prediction of national space expenditure capabilities and of the margin available for new projects, the selection and 'fitting' of projects into the margin, and the comparison of manpower requirements with forecast industrial capability are described. Subprograms which provide the additional capability to evaluate project returns and benefits are also discussed. Author (ESA)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N80-21190* National Aeronautics and Space Administration, Washington, D. C.
NASA PATENT ABSTRACTS BIBLIOGRAPHY. A CONTINUING BIBLIOGRAPHY. SECTION 1: ABSTRACTS, SUPPLEMENT 16
Jan. 1980 59 p
(NASA-SP-7039(16)) Avail: NTIS HC $8.50 CSCL 05B

Abstracts are cited for 138 patents and patent applications introduced into the NASA scientific and technical information system during the period July 1979 through December 1979. Each entry cib consists of a citation, an abstract, and in most cases, a key illustration selected from the patent or patent application. J.M.S.

N80-21191# Pennsylvania Univ., Philadelphia. Dept. of Decision Sciences.
DESCRIPTION OF THE WHARTON/ODA SYSTEM
David Oppenheim, ed., James S. Ribeiro, ed., and E. Gerald Hurst, Jr., ed. Dec. 1979 22 p refs
(Contract N00014-75-C-0440)
(AD-A079601; Rept-79-12-02) Avail: NTIS HC A02/MF A01 CSCL 05/2

The purpose of this document is to give a brief introduction to the hardware available in the Wharton Computer Center and the Decision Aiding Systems Laboratory (DASL), and to summarize the software which has been developed at Wharton under the Operational Decision Aiding Project. More detail about most of these features is available; in particular, some of the other software developed for use on the Wharton system may be of interest to other contractors, now that the system is easily accessible via the ARPANET. GRA

N80-21192# Pattern Analysis and Recognition Corp., Rome, N. Y.
ADVANCED QUERY TECHNIQUES Final Report, 19 Sep. 1977 - 19 Jun. 1979
C. P. Mah and John M. Morris Oct. 1979 182 p refs
(Contract F30602-77-C-0161; AF Proj. 4594)
(AD-A079626; RADC-TR-79-260) Avail: NTIS HC A09/MF A01 CSCL 05/2

The report describes an RADC sponsored R D effort directed at providing an improved natural language access to differently formatted target databases. Section I defines functional characteristics of on-line intelligence information systems within the current state-of-the-art; describes the rationale of the AQT effort, and provides a comparison between the AQT approach and other approaches inherent in the existing information systems with a practical orientation. Section 2 describes basic concepts of the AQT approach (extended relational data models, intermediate query language, table driven translation). Linguistic implementation of natural language query techniques is provided in Section 3. Section 4 deals with the methodology of accessing differently formatted target databases. Section 5 describes some special problems in querying target databases (e.g., generic keys, ellipsis, purging a context, conversational postulates). Section 6 constitutes a detailed description of the presently available AQT testbed system. Section 7 provides criteria for evaluation of user interface languages for database management systems. Section 8 is a statement of conclusions including present status and results; operational evaluation criteria; areas for further work, plans, summary and directions. GRA

N80-21193# National Technical Information Service, Springfield, Va.
MANAGEMENT INFORMATION SYSTEMS, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Nov. 1977 - Nov. 1979
Jack E. Jones Dec. 1979 133 p Supersedes NTIS/PS-78/1069; NTIS/PS-77/0918; NTIS/PS-76/0779; NTIS/PS-75/601 (PB80-802739; NTIS/PS-78/1069; NTIS/PS-77/0918; NTIS/PS-76/0779; NTIS/PS-75/601) Avail: NTIS HC $30.00/MF $30.00 CSCL 05B

General studies as well as application studies in the fields of transportation, education, personnel management, and military sciences are cited. This updated bibliography contains 126 abstracts, 65 of which are new entries to the previous edition. GRA

N80-21194# Capital Systems Group, Rockville, Md.
THE IMPACT OF BEHAVIORAL AND TECHNICAL INFORMATION INTERVENTIONS ON INDUSTRIAL R AND D PROJECTS Final Report
Edwin E. Olson, Elizabeth C. Fake, Dale G. Lake, and Brigitte D. Huybrechts 15 Nov. 1979 214 p
(Grant NSF DSI-77-18073)
(PB80-110265) Avail: NTIS HC A10/MF A01 CSCL 05B

The acquisition, use, and transfer of information both within the research and development lab and between the research and development lab and the engineering and manufacturing divisions in one company were investigated. The experiments included information searches for individual projects, information specialists joining project teams, workshops to improve the management of information, and improved communication between research and development scientists and engineers and their clients in the operating divisions. Findings about the correlation of behavioral and technological changes in technical information and the quality of research and development results, and implications for augmenting existing formal and informal channels of communication are discussed. GRA

N80-21195# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
SOURCE CODING WITH SIDE INFORMATION AND UNIVERSAL CODING
Robert G. Gallager Sep. 1979 41 p refs
(Grant NSF ENG-77-19971)
(PB80-108343; LIDS-P-937) Avail: NTIS HC A03/MF A01 CSCL 09D

Two problems concerning noiseless source coding with side information are considered. It is shown that not only is the maximum reliable transmission rate unaffected by whether or not the encoder has access to the side information, but also the block error probability is essentially unaffected and that, in a sense, all the encoder need know about the source is the alphabet size. The second problem considered is that where neither the encoder nor decoder knows the side information and good performance, in some sense, is required for all values of side information (i.e., universal coding). It is shown that the minmax redundancy and the maxmim redundancy, are essentially the same for variable length codes. Finally, a similar minmax, maxmim equivalence for error probability with block codes is established. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N80-21196# Union Carbide Corp., Oak Ridge, Tenn. Computer Sciences Div.
DESCRIPTION OF DATA ENTRY FOR AUTOMATED COST ESTIMATING
N. H. VanWie Oct. 1979 40 p
(Contract W-7405-eng-26)
(K/CSD/TM-29-Rev-1) Avail: NTIS HC A03/MF A01

A series of computer programs, developed to aid the computational and reporting phases of preparing a project cost estimate are presented. The data base for a project is subdivided into three types of data or files: a title file, a nucleus file, and a file of cost sheets with optional schedules. The data requirements and formatting specifications for preparation of these files are described. Examples are presented and alternative approaches to accomplish an end result are explained. DOE

N80-21197# Real Estate Research Corp., Chicago, Ill.
MARKETING AND MARKET ACCEPTANCE DATA FROM THE RESIDENTIAL SOLAR DEMONSTRATION PROGRAM. VOLUME 1: DETAILED ANALYSIS, AUTUMN 1979
1979 218 p refs Sponsored in part by HUD
(PB80-115298; HUD-0050579) Avail: NTIS HC A10/MF A01 CSCL 05C

The marketing and market acceptance components of HUD's residential solar heating and cooling demonstration program, designed to promote the development of a self-sustaining solar energy industry, are analyzed. The actual experiences of actors and institutions involved in the market acceptance of solar houses are described. Emerging trends in the characteristics, opinions, and actions of participants in the demonstration program are identified and explored. All findings are based on marketing interviews with program participants, with a market acceptance model used to guide analysis. Practical information relevant to the construction industry and solar manufacturers is emphasized. GRA

N80-21198# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
GEOTHERMAL ENERGY MARKET PENETRATION: DEVELOPMENT OF A MODEL FOR THE RESIDENTIAL SECTION
Allen C. Goodman Sep. 1979 34 p refs
(Contracts EX-76-A-36-1008; DE-AI01-79ET-27025)
(PB80-118359; APL/JHU-QM-79-209; APL/JHU-GEMS-006; MCGER-79/003) Avail: NTIS HC A03/MF A01 CSCL 05C

A model was developed that examines the feasibility of using geothermal technology in heating residential structures. Specific account is taken of the small contribution of new housing to the total stock in any given year and of the durability of houses and their furnaces. Both aspects constrain the penetration of geothermal energy into the residential market. Other market penetration paradigms are discussed and a simple model of market penetration is presented that is based on the premise that homeowners will not abandon an existing furnace until its economic life is over. Behavioral parameters are considered and the model is extended from 20 to 40 years. Methods are discussed for collecting the needed data to determine market penetration, and ideas are proposed of ways to induce homeowners to give up economically viable furnaces to allow the firm providing the energy to reduce costs. GRA

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N80-21199# Committee on Commerce, Science, and Transportation (U. S. Senate).
PATENT POLICY, PART 2
Washington GPO 1980 110 p refs Joint Hearings before Comm. on Commerce, Sci., and Transportation and the Comm. on the Judiciary, 96th Congr., 2d Sess., 25 Jan. 1980
(GPO-58-551) Avail: Comm. on Commerce, Sci., and Transportation

Legislation and corresponding testimony concerning Federal policy for allocating patent rights to exploit inventions made in the course of government-sponsored research and development is presented. Emphasis is placed on stimulating the industrial innovation process by contributing to more effective utilization of such inventions. J.M.S.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N80-21200*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SUPPORTING RESEARCH AND TECHNOLOGY FOR AUTOMOTIVE STIRLING ENGINE DEVELOPMENT
William A. Tomazic 1980 20 p Presented at 5th Intern. Automotive Propulsion System Symp., Dearborn, Mich., 14-18 Apr. 1980
(NASA-TM-81495; E-400; DOE/NASA/1040-80/13) Avail: NTIS HC A02/MF A01 CSCL 13F

The technology advancement topics described are a part of the supporting research and technology (SRT) program conducted to support the major Stirling engine development program. This support focuses on developing alternatives or backups to the engine development in critical areas. These areas are materials, seals control, combustors and system analysis. Specific objectives and planned milestone schedules for future activities as now envisioned are described. These planned SRT activities are related to the timeline of the engine development program that they must support. A.M.S.

N80-21201*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FUEL ECONOMY SCREENING STUDY OF ADVANCED AUTOMOTIVE GAS TURBINE ENGINES
John L. Klann Mar. 1980 57 p
(Contract EC-77-A-31-1040)
(NASA-TM-81433; E-357; DOE/NASA/1040-80/11) Avail: NTIS HC A04/MF A01 CSCL 13F

Fuel economy potentials were calculated and compared among ten turbomachinery configurations. All gas turbine engines were evaluated with a continuously variable transmission in a 1978 compact car. A reference fuel economy was calculated for the car with its conventional spark ignition piston engine and three speed automatic transmission. Two promising engine/transmission combinations, using gasoline, had 55 to 60 percent gains over the reference fuel economy. Fuel economy sensitivities to engine design parameter changes were also calculated for these two combinations. Author

N80-21202*# Cleveland State Univ., Ohio.
ERROR ANALYSIS IN THE MEASUREMENT OF AVERAGE POWER WITH APPLICATION TO SWITCHING CONTROLLERS Contractor Report, Oct. 1978 - Oct. 1979
James E. Maisel Mar. 1980 84 p refs Sponsored by NASA
(Contract EC-77-A-31-1044)
(NASA-CR-159792; DOE/NASA/3222-80/1) Avail: NTIS HC A05/MF A01 CSCL 10B

Power measurement errors due to the bandwidth of a power meter and the sampling of the input voltage and current of a power meter were investigated assuming sinusoidal excitation and periodic signals generated by a model of a simple chopper system. Errors incurred in measuring power using a microcomputer with limited data storage were also considered. The behavior of the power measurement error due to the frequency responses

of first order transfer functions between the input sinusoidal voltage, input sinusoidal current, and the signal multiplier was studied. Results indicate that this power measurement error can be minimized if the frequency responses of the first order transfer functions are identical. The power error analysis was extended to include the power measurement error for a model of a simple chopper system with a power source and an ideal shunt motor acting as an electrical load for the chopper. The behavior of the power measurement error was determined as a function of the chopper's duty cycle and back EMF of the shunt motor. Results indicate that the error is large when the duty cycle or back EMF is small. Theoretical and experimental results indicate that the power measurement error due to sampling of sinusoidal voltages and currents becomes excessively large when the number of observation periods approaches one-half the size of the microcomputer data memory allocated to the storage of either the input sinusoidal voltage or current. M.G.

N80-21203*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AMTV HEADWAY SENSOR AND SAFETY DESIGN Final Report, Dec. 1978 - Jan. 1980
A. R. Johnston, M. Nelson, P. Cassell, and J. T. Herridge Jan. 1980 71 p refs Sponsored by NASA Prepared in cooperation with Battelle Columbus Labs., Ohio
(Contract DOT-AT-60008T)
(NASA-CR-162717; UMTA-CA-06-0088-80-1; JPL-Pub-79-120) Avail: NTIS HC A04/MF A01 CSCL 13F

A headway sensing system for an automated mixed traffic vehicle (AMTV) employing an array of optical proximity sensor elements is described, and its performance is presented in terms of object detection profiles. The problem of sensing in turns is explored experimentally and requirements for future turn sensors are discussed. A recommended headway sensor configuration, employing multiple source elements in the focal plane of one lens operating together with a similar detector unit, is described. Alternative concepts including laser radar, ultrasonic sensing, imaging techniques, and radar are compared to the present proximity sensor approach. Design concepts for an AMTV body which will minimize the probability of injury to pedestrians or passengers in the event of a collision are presented. K.L.

N80-21204# Department of Energy, Washington, D. C. Office of Conservation and Solar Applications.
ELECTRIC AND HYBRID VEHICLE PROGRAM Quarterly Report, Apr. - May 1979
Aug. 1979 31 p refs
(DOE/CS-0026-7) Avail: NTIS HC A03/MF A01

Progress in U.S. programs on the design, development, production, and performance testing of electric powered and hybrid electric powered vehicles is briefly summarized. DOE

N80-21205# Cambridge Systematics, Inc., Mass.
URBAN MASS TRANSPORTATION ENERGY CONSERVATION: SRGP OPERATING INSTRUCTIONS AND PROGRAM DOCUMENTATION, VOLUME 5 Final Report
J. F. MacMann and R. E. Nestle Oct. 1979 120 p refs
(Contract EM-76-C-01-8628)
(DOE/PE/8628-1-Vol-5) Avail: NTIS HC A06/MF A01

A computer program for Short Range Generalized transportation Policy (SRGP) analysis developed for use in analyzing the energy conservation potential of a broad spectrum of transit, carpooling, vanpooling, parking, pricing, and other transportation system management measures is described. It is intended for use in either an areawide or corridor context and in what is referred to as a sketch planning style of analysis. Output includes changes in fuel consumption, vehicle emissions, vehicle miles of travel, and modal shares for drive alone, shared ride, and transit. Changes in travel behavior are forecast relating to auto ownership, work trip mode choice, and the frequency, destination, and mode choice for both shopping and social/recreational nonwork travel. Using a random sample household forecasting procedure, SRGP is a modified version of the program UMODEL, distributed by the U.S. Urban Mass Transportation Administration as part of UTPS, the Urban Transportation Planning System. DOE

N80-21206# Cambridge Systematics, Inc., Mass.
URBAN TRANSPORTATION ENERGY CONSERVATION: CASE CITY APPLICATIONS OF ANALYSIS METHODOLOGIES, VOLUME 3 Final Report, Jul. 1976 - Sep. 1978
T. J. Atherton and J. H. Suhrbier Oct. 1979 160 p refs
(Contract EM-76-C-01-8628)
(DOE/PE/8628-1-Vol-3) Avail: NTIS HC A08/MF A01

Disaggregate travel demand methodologies were applied to the analysis of potential energy conservation strategies in three urban areas: Denver, Colorado; Fort Worth, Texas; and San Francisco, California. The methodologies are sketch planning in nature and include the forecasting of changes in automobile ownership; work trip model shares by drive alone, shared ride, and transit; nonwork trip frequency, destination, and mode choice; fuel consumption and vehicle emissions. Policies analyzed include those related as employer based ride sharing, parking management, transit, pricing, and traffic operations. Considerable variations in the potential effectiveness was found, among the three urban areas, depending in large part on the availability of alternative travel modes such as transit. Descriptions are provided of the individual policy analyses performed, the methods by which example policies were analyzed, the necessary data preparation activities, and the procedures used to adapt the set of travel demand models to the unique conditions of each of the three metropolitan areas. DOE

N80-21207# Cambridge Systematics, Inc., Mass.
URBAN TRANSPORTATION ENERGY CONSERVATION: ANALYTIC PROCEDURES FOR ESTIMATING CHANGES IN TRAVEL DEMAND AND FUEL CONSUMPTION, VOLUME 2 Final Report, Jul. 1976 - Sep. 1978
T. J. Atherton and J. H. Suhrbier Oct. 1979 153 p refs
(Contract EM-76-C-01-8628)
(DOE/PE/8628-1-Vol-2) Avail: NTIS HC A08/MF A01

Analytical tools used to evaluate the effectiveness of alternative transportation policies in achieving reductions in overall fuel consumption are presented. To ensure a high measure of accuracy, the analysis goes beyond the first order effects, i.e., the shift from single occupant autos as the mode chosen for the work trip to more fuel efficient means of travel. Questions treated include what will happen with the autos left at home as a result of increased carpooling for work trips. The methodology developed links together several disaggregate travel demand models to predict auto ownership, work trip mode choice, and nonwork travel demands. The theoretical basis for the travel demand models used is introduced. These models and their linkages both with each other and with the various submodels are described. The assumptions made in developing the model system and using it to forecast responses to alternative transportation policies are included. Emphasis is placed on the conceptual framework of the model system and specification of the individual models and submodels. DOE

N80-21208# Cambridge Systematics, Inc., Mass.
ANALYTICAL PROCEDURES FOR URBAN TRANSPORTATION ENERGY CONSERVATION: SUMMARY OF FINDINGS AND METHODOLOGIES, VOLUME 1 Final Report, Jul. 1976 - Apr. 1979
J. H. Suhrbier and W. D. Byrne Oct. 1979 54 p refs 5 Vol.
(Contract EC-76-C-01-8628)
(DOE/PE/8628-1-Vol-1) Avail: NTIS HC A04/MF A01

Analytical methodologies are described and illustrated for use in analyzing the energy conservation potential of candidate urban transportation measurements. Quantitative methodologies oriented to carpooling, vanpooling, transit, pricing, traffic regulation and control, and auto ownership are provided based on the use of disaggregate behavioral travel demand models. Changes are indicated in trip frequency and distribution as well as in travel model, operating conditions, and vehicle miles of travel. Trip-based estimates of fuel consumption and vehicle emissions are included. The methodologies employ manual sketch planning procedures, a programmable calculator, or a fully-calibrated computer program utilizing a random sample household enumeration forecasting technique. The developed methodologies were applied in cooperation with metropolitan planning organizations representing the Dallas-Fort Worth, San Francisco, and Denver urban areas. DOE

N80-21209# Booz-Allen and Hamilton, Inc., Bethesda, Md. Energy and Environment Div.

MECHANICAL ENERGY STORAGE TECHNOLOGY FOR TRANSPORTATION APPLICATIONS PROJECT PLAN
30 Nov. 1979 50 p refs Prepared for California Univ., Livermore. Lawrence Livermore Lab.
(Contract W-7405-eng-48)
(UCRL-15138; Rept-2613-005-001) Avail: NTIS HC A03/MF A01

Flywheel systems for regenerative braking and load leveling in electric and hybrid vehicles were studied with emphasis on safety and economy. It is concluded that the use of flywheel energy storage regenerative braking and load leveling systems will upgrade the performance of electric and hybrid vehicles and improve the fuel economy of heat engine/flywheel vehicles to a level required for acceptable market penetration. DOE

N80-21210# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TEST AND EVALUATION REPORT OF THE ERDC HYBRID-ELECTRIC VAN (HEVAN)
G. J. Klose May 1979 67 p
(Contract EX-76-A-31-1011)
(DOE/TIC-10232) Avail: NTIS HC A04/MF A01

The HEVAN or Hybrid-Electric Van is a battery powered electric vehicle with an on board gasoline fueled electric power generation unit. The HEVAN was developed from a Volkswagen transporter chassis. It is propelled by a series wound dc traction motor rated at 20 HP (14.9 kW) which is powered by sixteen 6-volt SGL lead acid batteries of nominally 96 volts. The motor power is controlled by an SCR chopper with a bypass contractor and drives the vehicle through a four-speed VW transaxle. The conventional VW hydraulic brake system is used; there is no provision for regenerative braking. The on board electric power generator consists of a 16-HP (11.9kW) gasoline engine driving a 7.5 kW alternator with a dc rectifier; this provides electrical power either directly to the drive motor or to the battery pack, depending on the battery charge state and the motor power requirements. Numerous tests were conducted with pure electric operation, but only limited results were obtained in the hybrid mode due to continual problems with the motor generator set. DOE

N80-21211# California Univ., Livermore. Lawrence Livermore Lab.
ENERGY STORAGE SYSTEMS FOR AUTOMOBILE PROPULSION
L. G. OConnell 26 Nov. 1979 35 p
(Contract W-7405-eng-48)
(UCID-18320) Avail: NTIS HC A03/MF A01

Energy storage power systems that are credible alternatives to the internal combustion engine system are evaluated. It is concluded that automotive electrical power systems can be developed for various performance levels. Most electricity using vehicles will weigh more and cost more than their internal combustion engine equivalents. If performance of these vehicles is reduced, they can be more cost competitive. Mechanical energy storage propulsion systems appear useful as power boosters for certain mission applications. DOE

N80-21212# Strasbourg Univ. (France). Bureau d'Economie Theorique et Appliques.
INNOVATIONS AND TECHNOLOGY TRANSFER. THE ROLE OF THE EUROPEAN SPACE AGENCY, VOLUME 1 Final Report [INNOVATIONS ET TRANSFERTS TECHNOLOGIQUES: LE ROLE DE L'AGENCE SPATIALE EUROPEENE]
Patrice Brendle, Patrick Cohendet, Regis LaruedeTournemine, Helwig Schmied, and Daniel Vitray Feb. 1979 79 p In FRENCH 2 Vol.
(Contract ESA-3669/77-F-DKR(SC))
(ESA-CR(P)-1219-Vol-1) Avail: NTIS HC A05/MF A01

The areas of the economy most receptive to technology transfer, or which are most likely to readily absorb technological innovations were identified. Industrial opinion was solicited concerning the promotion of technical innovations resulting from activities in the European Space Agency (ESA). The sectors where most technology transfer occurs are telecommunications, optics, solar energy, and data processing. The monetary value of the ESA contribution has been determined for various technical sectors. In the view of industry, ESA has a role to play in both fundamental research, and in reducing costs of development. The patent system must be ameliorized within the member states to meet competition in external markets. Author (ESA)

N80-21213# Strasbourg Univ. (France). Bureau d'Economie Theorique et Appliques.
INNOVATIONS AND TECHNOLOGY TRANSFER. THE ROLE OF THE EUROPEAN SPACE AGENCY. VOLUME 2: ANNEXES [INNOVATIONS ET TRANSFERTS TECHNOLOGIQUES: LE ROLE DE L'AGENCE SPATIALE EUROPEENE, RAPPORT ANNEXE]
Patrice Brendle, Patrick Cohendet, Regis LaruedeTournemine, Helwig Schmied, and Daniel Vitry Feb. 1979 41 p In FRENCH 2 Vol.
(Contract ESA-3669/78-F-DKR(SC))
(ESA-CR-(P)-1219-Vol-2) Avail: NTIS HC A03/MF A01

The economic measures used to determine the contributions of ESA and the methods of data analysis are described. An analysis of present and proposed market impact of 37 product areas, including the financial contribution attributes to ESA activities is presented. Efforts of various European governmental agencies to promote technology transfer are outlined. Author (ESA)

N80-21214# Massachusetts Univ., Amherst. Water Resources Research Center.
URBANIZATION AND WATER QUALITY PLANNING: THE 208 EXPERIENCE IN MASSACHUSETTS
Harry E. Schwarz, Brandon B. Johnson, Robert J. Caiazzo, and Debra E. Pincus Jan. 1979 146 p refs Prepared in cooperation with Clark Univ., Worcester, Mass.
(Contract DI-14-34-0001-8023)
(PB80-106743; WB0-00870; Pub-104; OWRT-A-104-Mass(1)) Avail: NTIS HC A07/MF A01 CSCL 13B

The degree of urbanization in an area that would affect the scope of the planning process, public participation in planning, and the plan itself was examined. Three measures of urbanization were used: the percentage of the region in urban land use; the proportion of the population served by sewers; and the population density. Each of these was an independent variable in assessing the interregional variation of attributes of the plans and of the planning process. It was found that the degree of urbanization does not appear to have been a significant factor in the 208 planning process. GRA

N80-21215# Public Technology, Inc., Washington, D. C.
PRIORITY R AND D NEEDS OF URBAN AMERICA, RESOURCE DOCUMENT
1979 22 p
(Grant NSF ISP-76-11055)
(PB80-106164; NSF/RA-790191) Avail: NTIS HC A02/MF A01 CSCL 13B

Priority statements for 1977 and 1978 of ten Task Forces on the Urban Consortium for Technology Initiatives are reported. The Consortium is a national cooperative of 36 cities and urban counties established to identify research and development needs of urban governments and to channel resources into the most critical areas. By identifying and establishing priorities for urban needs the Consortium provides local governments with a structured means of working together with the nation's R & D resources. Networking of local governments also provides a collective purchasing power. Priority needs were identified by each of the following Task Forces: Community and Economic Development; Criminal Justice; Energy Environmental Services; Fire Safety and Preparedness; Health; Human Resources; Management (finance and personnel); Public Works and Public Utilities; and Transportation. A precis of each listed need is included. GRA

N80-21216# District of Columbia Dept. of Environmental Services, Washington, D.C. Water Resources Management Administration.
EVALUATION OF DEWATERING DEVICES FOR PRODUCING HIGH-SOLIDS SLUDGE CAKE
Alan F. Cassel and Berinda P. Johnson Aug. 1979 192 p
(Contract EPA-68-03-2455)
(PB80-111503; EPA-600/2-79-123) Avail: NTIS HC A09/MF A01 CSCL 13B

Pilot plant dewatering tests were made to establish design and operating parameters for dewatering municipal waste water sludges on recessed plate filter presses, continuous belt presses, and retrofit units for a vacuum filter. Results from the 1.5 year study showed that when dewatering lime and ferric chloride-conditioned sludges, the recessed plate presses consistently produced a 30 to 40 percent solids filter cake. Belt presses produced cake solids from 25 to 30 percent when the polymer conditioning dosage was optimized. When used as a retrofit device to a vacuum filter, the belt press gave cake solids in the 30 to 40 percent range. Design parameters are developed to dewater a mixture of 67 percent secondary and 33 percent primary sludge in a full scale plant installation. GRA

N80-21217# Union Carbide Corp., South Charleston, W.Va. Chemicals and Plastics Div.

TREATMENT OF ORGANIC CHEMICAL MANUFACTURING WASTEWATER FOR REUSE Final Report, Apr. - Dec. 1976

Michael Scherm, Patrick M. Thomasson, Lester C. Boone, and Lawrence S. Magelssen Aug. 1979 173 p refs

(Grant EPA-S-801398)

(PB80-105166; EPA-600/2-79-184) Avail: NTIS HC A08/MF A01 CSCL 13B

The quality of water produced by each step of a state-of-the-art, commercially available process sequence and the feasibility and economics of renovating organic chemical wastewater for reuse as boiler feedwater or cycle cooling water were demonstrated using a 5-gpm pilot facility, located in Puerto Rico. The sequence consisted of sedimentation/filtration, carbon adsorption, pressure filtration, reverse osmosis, and ion-exchange. A pilot-scale boiler tested the product water as boiler feedwater at pressures, temperatures, and heat fluxes typical of full-scale manufacturing facilities. The cooling water test-loop studies indicated that special metallurgy would be required for the use of this renovated wastewater for cooling water. The total annualized cost of wastewater renovation to boiler feedwater quality at 67 percent water recovery, not including the cost of sludge or brine disposal, was $7.50/1000 gallons of product water in 1978. GRA

N80-21218# Bendix Research Labs., Southfield, Mich.

COLLISION AVOIDANCE RADAR BRAKING SYSTEMS INVESTIGATION, PHASE 3 STUDY Final Report, Sep. 1976 - May 1979

William R. Faris, Carl P. Tresselt, and Henry C. Yee May 1979 249 p refs

(Contract DOT-HS-6-01450)

(PB80-108939; RLD-8904; DOT-HS-805-049) Avail: NTIS HC A11/MF A01 CSCL 13L

The potential application of an anticipatory radar braking system in preventing motor vehicle accidents is described. The system description is divided into three sections: the design of the radar sensor, including the signal processing electronics, control panel display, and installation of the entire subsystem on the test vehicles. The design of the brake actuation subsystem and the anti-lock subsystem, and information about installation of these two subsystem on test vehicles; and functional tests conducted with the two test vehicles equipped with the radar braking system, is outlined. GRA

N80-21219# Systems Technology, Inc., Hawthorne, Calif.

DEVELOPMENT OF AERODYNAMIC DISTURBANCE TEST PROCEDURES. VOLUME 2: TECHNICAL REPORT Final Report, 30 Sep. 1977 - 30 May 1979

Richard H. Klein and Jeffrey R. Hogue Aug. 1979 188 p refs

(Contract DOT-HS-7-01716)

(PB80-118383; DOT-HS-805-079; TR-1117-1-2) Avail: NTIS HC A09/MF A01 CSCL 13F

The crosswind responses of twenty different vehicles were surveyed. Three test procedures were used in three different crosswind disturbance configurations. These were steering fixed, steering free, and driver control of land position. The crosswind configurations were straight pulse, doublet pulse, and a shaped profile. results showed that passenger cars, station wagons, trucks, and most vans have virtually no crosswind sensitivity problems, whereas the VW Microbus, the pickup/camper (in winds higher than 35 mph), cars pulling trailers, and mopeds do have potential problems. The collected test procedures, performance measures, crosswind configurations, and definitions of the relationship between subjective driver ratings and the objective measures. GRA

N80-21220# Vermont State Dept. of Health, Burlington.

OZONE AND ULTRAVIOLET RADIATION DISINFECTION FOR SMALL COMMUNITY WATER SYSTEMS Final Report

Linden G. Witherell, Ray L. Solomon, and Kenneth M. Stone Jul. 1979 49 p refs

(Contract EPA-68-03-2182)

(PB80-108418; EPA-600/2-79-060) Avail: NTIS HC A03/MF A01 CSCL 13B

Ozone and ultraviolet radiation were used as alternatives to chlorine for disinfection in several small existing community water systems. Both ozone and ultraviolet light were found to be inferior to chlorination from the standpoint of operation and maintenance requirements and maintaining disinfection in the distribution system. A disinfectant residual was found to be necessary even in the small water distribution systems studied. Neither ozone or ultraviolet provide a residual disinfectant. The main problem with chlorination in small community water systems is inadequate operation and maintenance. Inadequate operation and maintenance is a general problem of small community water systems, not limited to the disinfection aspect. GRA

N80-21221# American Society of Civil Engineers, New York. Urban Water Resources Research Council.

CHALLENGES IN URBAN RUNOFF CONTROL (PLANNING, IMPLEMENTATION AND SIMULATION) Final Report

M. B. McPherson Aug. 1979 47 p refs

(Grant NSF ENV-77-15668)

(PB80-107873; TM-37; NSF/RA-790172) Avail: NTIS HC A03/MF A01 CSCL 13B

Areawide planning for water pollution management was undertaken in a majority of metropolitan areas. Urban runoff considerations were an issue in many of these areas. In an effort to promote long range conjunctive quantity and quality planning, a dozen seminars, workshops, and conferences hosted by areawide planning agencies were conducted. Responses to points raised at these presentations plus findings from the monitoring of four on-going local jurisdiction master planning projects are reported. The postponed role of stream standards and the implications of their future enforcement are examined. Plan flexibility, cost allocation, available technology, scale of investments and technical interrelationships are considered. GRA

N80-21222# Envirotech Corp., Salt Lake City, Utah. Eimco Process Machinery Div.

CHEMICAL PRIMARY SLUDGE THICKENING AND DEWATERING

David DiGregorio, J. Brian Ainsworth, and Keith J. Mounteer Jul. 1979 290 p refs

(Contract EPA-68-03-0404)

(PB80-108970; EPA-600/2-79-055) Avail: NTIS HC A13/MF A01 CSCL 13B

The thickening and dewatering characteristics of chemical primary sludges were studied. Alum primary and ferric primary sludges were produced in parallel trains of a pilot operated using a municipal wastewater. Gravity thickening was evaluated using continuous, pilot scale gravity thickeners; dissolved air flotation thickening evaluations were performed using batch, bench-scale equipment. Sludge dewatering evaluations were performed for all chemical primary sludges using a pilot scale bowl centrifuge, vacuum belt filter and filter press. Correlations developed relating performance of each unit operation to specific characteristics identified for each chemical primary sludge are presented. An economic analysis of centrifugation and vacuum belt filtration of each chemical primary sludge is also presented. GRA

88 SPACE SCIENCES (GENERAL)

N80-21223# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.

[RESEARCH ACTIVITIES OF THE INSTITUTE FOR EXTRATERRESTRIAL PHYSICS] Annual Report, 1978 [TAETIGKEITSBERICHT 1978]
Jan. 1979 258 p refs In GERMAN Original contains color illustrations
(MPI-PAE/Extraterr-150; ISSN-034-8922) Avail: NTIS HC A12/MF A01

In situ plasma measurements in the vicinity of the Earth were taken. Experiments in the fields of infrared, X-ray, and gamma ray astronomy, and cosmic ray research are described. Progress in spectroscopic techniques, nonlinear optics, and laser spectroscopy is noted. Author (ESA)

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N80-21224*# National Aeronautics and Space Administration, Washington, D. C.
IMAGE PROPERTIES OF AN X-RAY TELESCOPE OF THE WOLTER-1 TYPE WITH EMPHASIS ON CONTRAST REDUCTION BY DIFFUSE REFLECTION Ph.D. Thesis
R. Lenzen Jan. 1980 105 p refs Transl. into ENGLISH of "Abbildungseigenschaften eines Roentgenteleskops vom Type Wolter-1 unter Besonderer beruecksichtigung der Kontrastverminderung Durch Diffuse Reflexion", West Germany, 1978 p 1-123 Original language document announced as A79-41829 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75805) Avail: NTIS HC A06/MF A01 CSCL 03A

Theoretical and experimental results are presented on the geometrical-optic imaging properties of a Wolter-1 type paraboloid-hyperboloid X-ray telescope. Particular consideration is given to the effect of microroughness of the mirror on the imaging properties. Experiments were conducted in which scattering properties were determined as a function of wavelength, incidence angle, and roughness of the plane mirrors. Results indicate the need for optimization of mirror material and polishing technology as well as the development of improved mirror manufacturing techniques. The use of transmission gratings along with the Wolter-1 type telescope in spectroscopy applications is discussed. Author

N80-21225# California Univ., Berkeley. Lawrence Berkeley Lab.
SUPERCONDUCTING MAGNET SYSTEM FOR THE SPIRIT COSMIC RAY SPACE TELESCOPE
M. A. Green, J. M. DeOlivares, G. Tarle, P. B. Price, and E. K. Shirk Aug. 1979 18 p refs Presented at the Cryog. Eng. Conf., Madison, Wis., 21 Aug. 1979
(Contract W-7405-eng-48)
(LBL-9699; CONF-790815-32) Avail: NTIS HC A02/MF A01

The SPIRIT (a superconducting passive iron isotope telescope) experiment which requires a large volume of 2T field in order to achieve enough resolution to study heavy primary cosmic rays is discussed. It is proposed that the SPIRIT superconducting magnet system and its experimental package would be used in one of the space shuttles. The superconducting magnet design, based on thin high current density solenoid technology, is described. The superconducting magnet system consists of a number of coils which generate a 2T induction within the experiment, and at the same time allow free access to the package by cosmic rays. The superconducting magnet system uses a high current density conductor which is protected by a shorted secondary circuit. The magnet coils are to be cooled by pumped two phase helium which is circulated through tubes. Refrigeration is supplied from a large liquid helium dewar. DOE

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N80-21226 Johns Hopkins Univ., Baltimore, Md.
INTERSTELLAR MATTER AND EXTRAGALACTIC LIGHT Ph.D. Thesis
Rodney Charles Anderson 1979 246 p
Avail: Univ. Microfilms Order No. 8006911

Analyses of two experimental programs designed to estimate the density of the universe are reported. First, the Copernicus satellite was used to observe hydrogen and deuterium absorption in local interstellar matter. Secondly, two far ultraviolet spectrometers were used to study galactic plane light scattered off interstellar dust, in order to measure the scattering properties of the dust, and also to detect cosmic background radiation. The interstellar absorption spectra were obtained using bright, close stars as light sources. The density and temperature of interstellar hydrogen and deuterium along the line of sight to each target star were obtained by fitting appropriate models to the data. A set of acceptable densities and temperatures is presented for each star. Dissert. Abstr.

N80-21227 Cornell Univ., Ithaca, N. Y.
LATE-STAGE EVOLUTION OF SUPERNOVA REMNANTS Ph.D. Thesis
William Isaac Newman 1979 257 p
Avail: Univ. Microfilms Order No. 8003989

The evolution of spherically symmetric supernova remnants is examined by analytic and numerical means. The blast is assumed to take place in an homogeneous interstellar medium with a uniform density and an initially constant total energy. An approximate representation of the radiative cooling is included, precipitating a thermal instability and producing a cold dense shell. The dynamical transition from adiabatic to radiation dominated behavior is numerically simulated by a modified form of the pseudo viscosity method. Dissert. Abstr.

N80-21228 City Univ. of New York, N. Y.
THE HIGH LATITUDE EXTENSIONS OF GALACTIC SPIRAL ARMS Ph.D. Thesis
Judith Ellen Soukup 1979 202 p
Avail: Univ. Microfilms Order No. 8006747

The high z extensions of spiral arms in our galaxy were investigated observationally and theoretically. Numerical calculations of interstellar gas flow in a tightly wound spiral density wave were performed. The equations were time dependent; the two spatial dimensions were along the streamlines in the galactic plane and perpendicular to the plane. The analog between one dimensional gas flows into a potential hill and into a converging diverging nozzle is discussed to show exactly why and where a shock forms in a spiral arm. Two thermodynamic models of the gas are considered: an isothermal gas and a gas whose temperature increases with height from the galactic plane.
Dissert. Abstr.

N80-21229 Wisconsin Univ. - Madison.
THE STRUCTURE AND DYNAMICS OF H2 REGIONS Ph.D. Thesis
Gary Lee Welter 1979 80 p
Avail: Univ. Microfilms Order No. 8001642

The early evolution of H2 regions, through the first few 100,000 years, is investigated under conditions of enhanced central density and increasing cluster luminosity. It is found that a D type ionization front can overtake the precursor shock under conditions of a fairly steep density-gradient such as may exist just beyond a stellar dust cocoon, or as new stars turn on within the H2 region. The shock is converted into a strong, outward moving pressure pulse as it is ionized. Rayleigh-Taylor instability in the shocked layer occurs as the ionization front approaches the shock, but the neutral globules so produced have a comparatively small and short term effect on nebular dynamics. The evolutionary effects of different recombination rates within the ionization front and different cooling rates within the shocked layer are investigated and found to be small. Possible modifica-

tions which the presence of dust or stellar winds could produce are briefly considered. Dissert. Abstr.

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N80-21230 Pennsylvania State Univ., University Park.
AN INVESTIGATION AND ANALYSIS OF THE DENSITY AND THERMAL BALANCE OF THE MARTIAN IONOSPHERE Ph.D. Thesis
Ronald Perry Rohrbaugh 1979 176 p
Avail: Univ. Microfilms Order No. 8006049

The density and thermal balance of the Martian ionosphere were investigated and compared with the observational data from Vikings 1 and 2. The effects of diffusion and thermal conduction perpendicular to the assumed magnetic fields were included. An analysis of the thermalization of energetic O2(+) produced by the major ion neutral reactions was developed and presented. Dissert. Abstr.

N80-21231 Florida State Univ., Gainesville.
ON THE PRODUCTION OF LONG-PERIOD COMETS BY STELLAR PERTURBATIONS OF THE OORT COMET CLOUDS Ph.D. Thesis
Barbara Schreur 1979 118 p
Avail: Univ. Microfilms Order No. 8007506

A model cloud surrounding the Sun is established, and the perturbation to the orbits of the comets in this cloud as a result of the action of passing stars are presented. The model cloud of comets consists of some 100,000 comets with orbital orientations selected at random, and perihelion and aphelion distances selected to give a reasonable concentration of the space densities of the comets toward the Sun. A distribution of 100 passing stars was chosen to be representative of the probability of a given type of star passing at a given distance from the Sun. A perturbation of each cometary orbit due to each passing star was calculated. The individual perturbations were calculated as impuluses to be applied instantaneously to the orbit of a comet. As a check on the accuracy of this method, a number of perturbations were calculated by numerically integrating the equations of motion. The impulse method was found to be sufficiently accurate to determine the changes in the distribution of orbital parameters. Dissert. Abstr.

N80-21232 Cornell Univ., Ithaca, N. Y.
GEOMORPHOLOGY OF MARTIAN VALLEYS Ph.D. Thesis
David Christopher Pieri 1979 293 p
Avail: Univ. Microfilms Order No. 8003975

A broad range of topics related to Martian valleys are discussed including: terminology, classification, distribution, morphology, age, quantitative analysis of pattern, physics of flow, origin, and the relation of Martian valleys to climatic change. Channels are distinguished from valleys on the basis of: (1) the greater size of the large channels; and (2) the presence of flow erosions morphology in channels. Valleys generally are small (less than 5 km wide, less than 1 km deep), show little direct evidence of erosion by flow, and form ramified networks which coalesce down regional slopes. Data on morphology and planimetric characteristics of 240 Martian valley networks are presented. Dissert. Abstr.

N80-21233 California Univ., Los Angeles.
IMPACT CRATERS FROM CENTIMETERS TO MEGAMETERS Ph.D. Thesis
Steven Kent Croft 1979 282 p
Avail: Univ. Microfilms Order No. 8007428

The physics of cratering is related to the geology of craters by interpretation of empirical morphometrical relations determined for observed craters in terms of physical mechanisms known to be operative in cratering. A crater modification model is presented which quantitatively reproduces interior and ejecta volumes, rim heights and widths, apparent depths, and floor diameters of complex lunar craters. Diameter measurements are presented for central peak, peak ring, and multiring basins on the Moon, Mercury, Mars and the Earth. Rings of basins on all four planets are assigned to structural classes that are defined by morphological, morphometrical and geophysical criteria. Empirical relationships between structurally equivalent classes of rings are derived. Dissert. Abstr.

N80-21234*# Missouri Univ. -Rolla. Dept. of Chemistry.
TRANSPORT PROPERTIES IN THE ATMOSPHERE OF JUPITER Semiannual Progress Report, Jul. - Dec. 1979
Louis Biolsi, Jr. 1979 35 p refs
(Grant NsG-1369)
(NASA-CR-162897) Avail: NTIS HC A03/MF A01 CSCL 03B

The computer program used to obtain transport properties for the Hulburt-Hirschfelder potential was tested. Transport properties for the C-C interaction were calculated. Rough estimates for transport properties for the important ablation species were obtained as well as estimates of transport properties for some of the species associated with photochemical smog. The results are discussed. A.R.H.

N80-21235*# Atmospheric and Environmental Research, Inc., Cambridge, Mass.
OUTER SATELLITE ATMOSPHERES: THEIR EXTENDED NATURE AND PLANETARY INTERACTIONS Final Report, Feb. 1979 - Mar. 1980
William H. Smyth Apr. 1980 104 p refs
(Contract NASw-3174)
(NASA-CR-162902; FR-7) Avail: NTIS HC A06/MF A01 CSCL 03B

Highly developed numerical models are applied to interpret extended-atmosphere data for the sodium cloud of Io and the hydrogen torus of Titan. Solar radiation pressure was identified and verified by model calculations as the mechanism to explain two different east-west asymmetries observed in the sodium cloud. Analysis of sodium line profile data, suggesting that a Jupiter magnetospheric wind may be responsible for high speed sodium atoms emitted from Io, and preliminary modeling of the interaction of the Io plasma torus and Io's sodium cloud are also reported. Models presented for Titan's hydrogen torus are consistent both with the recent Pioneer 11 measurements and earlier Earth-orbiting observations by the Copernicus satellite. Progress is reported on developing models for extended gas and dust atmospheres of comets. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N80-21236 Stanford Univ., Calif.
TO THE SOLAR FOCI Ph.D. Thesis
David Sonnabend 1979 324 p
Avail: Univ. Microfilms Order No. 8006356

The theory that the Sun is likely to act as a lens for gravitational radiation, with foci in the outer solar system is discussed. It is suggested that missions to these foci have the potential of directly measuring the density structure of the Sun. Other applications include gravitational wave astronomy and tests of general relativity. The theory is examined with emphasis upon the engineering aspects of focal missions - primarily spacecraft design and performance. Other topics studied include solar optics, gravitational wave detectors, navigation, and the design of missions for different purposes. Specifically, it will be shown that shuttle launched chemical rockets have a substantial capability for reacting some foci; and that all can be reached with large payloads using nuclear isotope - electric propulsion. Dissert. Abstr.

N80-21237*# Lockheed Missiles and Space Co., Palo Alto, Calif.

ANALYSIS OF TIME DEPENDENT PHENOMENA OBSERVED WITH THE LPSP OSO-8 INSTRUMENT Final Report
John W. Leibacher 15 Oct. 1979 170 p refs
(Contract NASw-3053)
(NASA-CR-162908) Avail: NTIS HC A08/MF A01 CSCL 03B

Data obtained by the Laboratoire de Physique Stellaire et Planetaire's ultraviolet spectrometer onboard the OSO-8 spacecraft were analyzed in an effort to dynamically model the solar chromosphere as an aid in enhancing knowledge of the dynamical processes themselves and of spectral line formation in the dynamic chromosphere. Repeated spectral scans of strong, optically thick resonance lines formed in the solar chromosphere were examined for indications of oscillatory velocities and intensities among other indications of velocity which were studied, the blue peak is reasonably well defined, and the position of a parabolic filter fitted by the least squares method was used to define it. Observed chromospheric oscillation periods are discussed as well as the variations in altitude of the emitting region which result primarily from the motion up and down during the oscillation. A.R.H.

N80-21238*# Stanford Univ., Calif. Inst. of Plasma Studies.
DOPPLER OBSERVATIONS OF SOLAR ROTATION
P. H. Scherrer Mar. 1980 11 p refs Submitted for publication
(Contracts NAS5-24220; N00014-76-C-0207; Grants NGR-05-020-559; NSF ATM-77-20580)
(NASA-CR-162886; SU-SUIPR-804) Avail: NTIS HC A02/MF A01 CSCL 03B

Daily observations of the photospheric equatorial rotation rate using the Doppler effect mode at the Sanford Solar Observatory are presented. These observations show no variations in the rotation rate that exceed the observational error of about one percent. The average rotation rate is indistinguishable from that of sunspots and large scale magnetic field structures.J.M.S.

N80-21239*# Stanford Univ., Calif. Inst. for Plasma Research.
ON THE NATURE OF THE APPARENT RESPONSE OF VORTICITY AREA INDEX TO THE SOLAR MAGNETIC FIELD
J. M. Wilcox and P. H. Scherrer Mar. 1980 23 p refs
(Grant NGR-05-020-559; Contract N00014-76-C-0207; Grant NSF ATM-77-20580)
(NASA-CR-162915; SU-SUIPR-802) Avail: NTIS HC A02/MF A01 CSCL 03B

The characteristics of tropospheric circulation that are involved in the apparent response of the vorticity area index (VIA) as the solar magnetic field is carried past the Earth by the solar wind are discussed. It is shown that the response is concentrated in the tropospheric regions of most intense circulation, i.e. the central portions of well-formed low pressure troughs. Factors that must be considered when assessing the Sun-weather effect in the years from 1947 to 1978 are included. J.M.S.

N80-21240*# Stanford Univ., Calif. Inst. of Plasma Research.
THE ROTATION OF THE SUN: OBSERVATIONS AT STANFORD
J. M. Scherrer, J. M. Wilcox, and L. Svalgaard Feb. 1980 34 p refs
(Contract NAS5-24420; Grant NGR-05-020-559; Contract N00014-76-C-0207; Grant NSF ATM-77-20580)
(NASA-CR-162914; SU-SUIPR-799) Avail: NTIS HC A03/MF A01 CSCL 03B

Daily observations of the photospheric rotation rate using the Doppler effect made at the Stanford Solar Observatory since May 1976 are analyzed. Results show that these observations show no daily or long period variations in the rotation rate that exceed the observational error of about one percent. The average rotation rate is the same as that of the sunspot and the large-scale magnetic field structures. J.M.S.

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

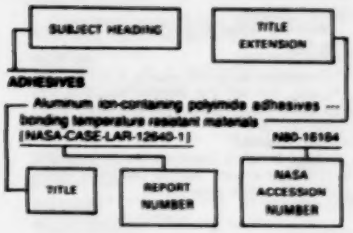
No abstracts in this category.

99 GENERAL

N80-21241# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES, VOLUME 33, NUMBER 11
R. E. Machol, ed. and Dodie Thomas, ed. Nov. 1979 53 p
(AD-A079711; ESN-33-11) Avail: NTIS HC A04/MF A01 CSCL 05/2

This is a monthly publication presenting brief articles concerning recent developments in European Scientific Research. It is hoped that these articles (which do not constitute part of the scientific literature) may prove of value to American scientists by calling attention to current developments and to institutions and individuals engaged in these scientific efforts. The articles are written primarily by members of the staff of ONRL and occasionally articles are prepared by, or in cooperation with, members of the scientific staff of the United States Air Force's European Office of Aerospace Research and Development and the United States Army Research and Standardization Group. Articles are also contributed by visiting Stateside scientists. GRA

Typical Subject Index Listing



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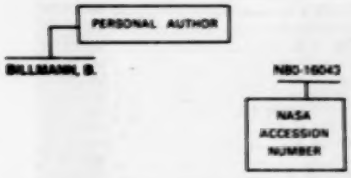

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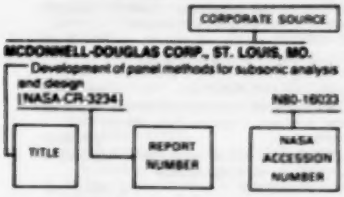

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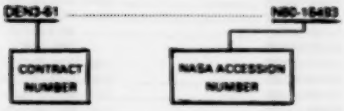

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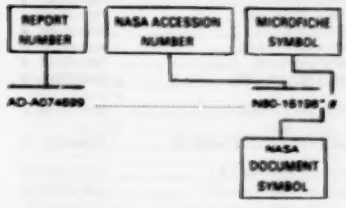

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NASA-CR-162902 ..... N80-21235* #
NASA-CR-162903 ..... N80-20397* #
NASA-CR-162904 ..... N80-20814* #
NASA-CR-162905 ..... N80-20815* #
NASA-CR-162906 ..... N80-20964* #
NASA-CR-162907 ..... N80-20816* #
NASA-CR-162908 ..... N80-21237* #
NASA-CR-162909 ..... N80-20312* #
NASA-CR-162910 ..... N80-21142* #
NASA-CR-162911 ..... N80-20273* #
NASA-CR-162912 ..... N80-20817* #
NASA-CR-162913 ..... N80-20404* #
NASA-CR-162914 ..... N80-21240* #
NASA-CR-162915 ..... N80-21239* #
NASA-CR-162916 ..... N80-21037* #

NASA-SP-4009 ..... N80-20437* #
NASA-SP-7039(16) N80-21190*
NASA-SP-7041(24) N80-20717*

NASA-TM-58225 ..... N80-21059* #
NASA-TM-73279 ..... N80-20564* #
NASA-TM-75505 ..... N80-20229* #
NASA-TM-75506 ..... N80-21025* #
NASA-TM-75735 ..... N80-21014* #
NASA-TM-75774 ..... N80-20590* #
NASA-TM-75800 ..... N80-21101* #
NASA-TM-75805 ..... N80-21224* #
NASA-TM-76002 ..... N80-21019* #
NASA-TM-76022 ..... N80-21020* #

NASA-TM-76042 ..... N80-20920* #
NASA-TM-76056 ..... N80-21023* #
NASA-TM-76069 ..... N80-21026* #
NASA-TM-76099 ..... N80-21021* #
NASA-TM-76107 ..... N80-21017* #
NASA-TM-76108 ..... N80-21024* #
NASA-TM-76110 ..... N80-21022* #
NASA-TM-76119 ..... N80-21015* #
NASA-TM-76136 ..... N80-21016* #
NASA-TM-78801 ..... N80-20286* #
NASA-TM-79269 ..... N80-20787* #
NASA-TM-80144 ..... N80-21043* #
NASA-TM-80226 ..... N80-20302* #
NASA-TM-80232 ..... N80-20231* #
NASA-TM-80236 ..... N80-21045* #
NASA-TM-80237 ..... N80-20227* #
NASA-TM-80550 ..... N80-20722* #
NASA-TM-80642 ..... N80-20723* #
NASA-TM-81415 ..... N80-20272* #
NASA-TM-81422 ..... N80-20313* #
NASA-TM-81433 ..... N80-21201* #
NASA-TM-81439 ..... N80-20532* #
NASA-TM-81443 ..... N80-20398* #
NASA-TM-81449 ..... N80-20581* #
NASA-TM-81450 ..... N80-20304* #
NASA-TM-81455 ..... N80-20370* #
NASA-TM-81456 ..... N80-20314* #
NASA-TM-81459 ..... N80-20274* #
NASA-TM-81491 ..... N80-20275* #
NASA-TM-81495 ..... N80-21200* #
NASA-TM-81778 ..... N80-20251* #
NASA-TM-81783 ..... N80-20223* #
NASA-TM-81784 ..... N80-20529* #
NASA-TM-81785 ..... N80-20620* #
NASA-TM-81788 ..... N80-20228* #
NASA-TM-81789 ..... N80-20290* #
NASA-TM-81793 ..... N80-20280* #

NASA-TP-1517 ..... N80-20527* #
NASA-TP-1566 ..... N80-20619* #
NASA-TP-1629 ..... N80-20986* #

NATO/CCMS-71-REV ..... N80-20953 #

NBS-GCR-79-181 ..... N80-20912 #

NBS-HB-129 ..... N80-20569 #

NBS-MONO-25-SECT-16 ..... N80-21183 #

NBS-SP-562 ..... N80-20441 #
NBS-SP-583 ..... N80-20325* #

NBS-TN-1105 ..... N80-20509 #
NBS-TN-1106 ..... N80-20570 #
NBS-TN-1109 ..... N80-20477 #

NBSIR-79-1615 ..... N80-20571 #
NBSIR-79-1621 ..... N80-20365 #
NBSIR-79-1756 ..... N80-20508 #
NBSIR-79-1910 ..... N80-20364 #

NCAR/TN-144/STR ..... N80-21001 #

NCSU-FMR-5 ..... N80-20996 #

NEAR-TR-198 ..... N80-20236 #

NEPRF-TR-79-01 ..... N80-20992 #

NMEI-16 ..... N80-20914 #
NMEI-45 ..... N80-20913 #

NOAA-TM-NESS-106 ..... N80-20981 #

NOAA-TM-NOS-NGS-5 ..... N80-20977 #

NOAA-TM-NWS-NMC-83 ..... N80-20995 #

NOAA-TR-NOS-78 ..... N80-21010 #
NOAA-TR-NOS-79-NGS-12 ..... N80-20976 #

NOAA-TR-NWS-23 ..... N80-20999 #

NOAA-79092004 ..... N80-20939 #
NOAA-79092405 ..... N80-21012 #
NOAA-79100101 ..... N80-20994 #
NOAA-79100108 ..... N80-20976 #
NOAA-79100501 ..... N80-20977 #
NOAA-79100503 ..... N80-21000 #
NOAA-79100504 ..... N80-21002 #
NOAA-79101101 ..... N80-20999 #
NOAA-79101102 ..... N80-21010 #
NOAA-79101901 ..... N80-20981 #
NOAA-79102201 ..... N80-21003 #
NOAA-79102404 ..... N80-21011 #
NOAA-79112304 ..... N80-21004 #

NORDA-TN-23 ..... N80-20790 #
NORDA-TN-26 ..... N80-20492 #

NOSC/TD-291 ..... N80-21102 #

NRL-MR-4095 ..... N80-20539 #
NRL-MR-4116 ..... N80-20968 #
NRL-MR-4116 ..... N80-20969 #
NRL-MR-4127 ..... N80-21159* #
NRL-MR-4131 ..... N80-20347 #
NRL-MR-4132 ..... N80-20540 #

NRL-8320 ..... N80-21145 #
NRL-8350 ..... N80-20408 #

NSF/RA-790172 ..... N80-21221 #
NSF/RA-790191 ..... N80-21215 #
NSF/RA-790199 ..... N80-21084 #
NSF/RA-790200 ..... N80-20980 #
NSF/RA-790232 ..... N80-21096 #
NSF/RA-790249 ..... N80-20805 #
NSF/RA-790266 ..... N80-20440 #

NSWC/TR-79-43 ..... N80-20320 #
NSWC/TR-79-256 ..... N80-20299 #

NTIS/PS-75/044 ..... N80-20585 #
NTIS/PS-75/073 ..... N80-21031 #
NTIS/PS-75/436 ..... N80-20259 #
NTIS/PS-75/459 ..... N80-20478 #
NTIS/PS-75/601 ..... N80-21193 #
NTIS/PS-75/733 ..... N80-20586 #
NTIS/PS-75/737 ..... N80-20795 #
NTIS/PS-75/785 ..... N80-20394 #
NTIS/PS-75/792 ..... N80-20585 #
NTIS/PS-75/808 ..... N80-20600 #
NTIS/PS-75/818 ..... N80-20555 #
NTIS/PS-76/0552 ..... N80-20259 #
NTIS/PS-76/0553 ..... N80-20478 #
NTIS/PS-76/0581 ..... N80-20288 #
NTIS/PS-76/0779 ..... N80-21193 #
NTIS/PS-76/0838 ..... N80-20795 #
NTIS/PS-76/0940 ..... N80-20555 #
NTIS/PS-76/0967 ..... N80-21031 #
NTIS/PS-76/0969 ..... N80-20600 #
NTIS/PS-76/0970 ..... N80-20800 #
NTIS/PS-76/0979 ..... N80-20586 #
NTIS/PS-76/1042 ..... N80-20585 #
NTIS/PS-76/1048 ..... N80-20394 #
NTIS/PS-77/0609 ..... N80-20259 #
NTIS/PS-77/0625 ..... N80-20478 #
NTIS/PS-77/0682 ..... N80-20288 #
NTIS/PS-77/0918 ..... N80-21193 #
NTIS/PS-77/0947 ..... N80-20795 #
NTIS/PS-77/1081 ..... N80-21031 #
NTIS/PS-77/1116 ..... N80-20555 #
NTIS/PS-77/1122 ..... N80-20800 #
NTIS/PS-77/1161 ..... N80-20910 #
NTIS/PS-77/1168 ..... N80-20586 #
NTIS/PS-77/1176 ..... N80-20585 #
NTIS/PS-77/1179 ..... N80-20394 #
NTIS/PS-78/0685 ..... N80-20288 #
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NTIS/PS-78/1089 ..... N80-21193 #
NTIS/PS-78/1195 ..... N80-21031 #
NTIS/PS-78/1277 ..... N80-20600 #
NTIS/PS-78/1288 ..... N80-20910 #
NTIS/PS-78/1307 ..... N80-20586 #
NTIS/PS-78/1318 ..... N80-20394 #
NTIS/PS-78/1326 ..... N80-20585 #
NTIS/PS-78/1344 ..... N80-20555 #
NTIS/PS-79/0726/4 ..... N80-21041 #
NTIS/PS-79/0732/2 ..... N80-20952 #
NTIS/PS-79/0750/4 ..... N80-20478 #
NTIS/PS-79/0754/6 ..... N80-20288 #
NTIS/PS-79/0762/9 ..... N80-20259 #

NUREG-CR-0967 ..... N80-20505 #

NVO-185-REV-1 ..... N80-21134 #
NVO-196-11 ..... N80-21129 #
NVO-01556-1 ..... N80-20792 #

NYU/DAS-79-18 ..... N80-20545 #

ONR-R-2 ..... N80-20372 #

OR-15764 ..... N80-20455 #

ORAU-IEA-79-19(D) ..... N80-20907 #

ORNL/CSD/TM-65 ..... N80-21095 #

ORNL/NUREG/TM-335 ..... N80-20505 #

ORNL/TM-6484 ..... N80-20549 #
ORNL/TM-6920 ..... N80-21082 #
ORNL/TM-6999 ..... N80-20386 #

ORO-4814-T1 ..... N80-20355 #
ORO-5020-T1 ..... N80-20415 #
ORO-5205-10 ..... N80-20973 #

OSURF-780075/783430 ..... N80-21075 #

OTA-M-97 ..... N80-20392 #

OWRT-A-104-MASS(1) ..... N80-21214 #

OWRT-B-021-MICH(2) ..... N80-20602 #
OWRT-B-218-TEX(1) ..... N80-20601 #

OWRT-S-0096(7543)(1) ..... N80-20357 #

OWRT-9601(1) ..... N80-20604 #

PATR-1037-79-6 ..... N80-20291 #

PB80-11012 ..... N80-20569 #
PB80-100654 ..... N80-20360 #
PB80-100882 ..... N80-20916 #
PB80-102619 ..... N80-20393 #
PB80-102809 ..... N80-20942 #
PB80-102874 ..... N80-20945 #
PB80-103450 ..... N80-20477 #
PB80-103955 ..... N80-20479 #
PB80-103989 ..... N80-21001 #
PB80-104987 ..... N80-20915 #
PB80-104995 ..... N80-20941 #
PB80-105109 ..... N80-20325* #
PB80-105141 ..... N80-20571 #
PB80-105186 ..... N80-21217 #
PB80-105331 ..... N80-20508 #
PB80-105976 ..... N80-20256 #
PB80-106164 ..... N80-21215 #
PB80-106263 ..... N80-20443 #
PB80-106404 ..... N80-20442 #
PB80-106438 ..... N80-20932 #
PB80-106836 ..... N80-20907 #
PB80-106743 ..... N80-21214 #
PB80-107030 ..... N80-21027 #
PB80-107246 ..... N80-21108 #
PB80-107501 ..... N80-20911 #
PB80-107865 ..... N80-21084 #
PB80-107873 ..... N80-21221 #
PB80-107899 ..... N80-20939 #
PB80-107907 ..... N80-20980 #
PB80-108160 ..... N80-20933 #
PB80-108293 ..... N80-21028 #
PB80-108343 ..... N80-21195 #
PB80-108392 ..... N80-20949 #
PB80-108419 ..... N80-21220 #
PB80-108467 ..... N80-20950 #
PB80-108475 ..... N80-20358 #
PB80-108574 ..... N80-20954 #
PB80-108616 ..... N80-20914 #
PB80-108624 ..... N80-20913 #
PB80-108939 ..... N80-21218 #
PB80-108970 ..... N80-21222 #
PB80-109150 ..... N80-21013 #
PB80-109978 ..... N80-20953 #
PB80-110133 ..... N80-20441 #
PB80-110265 ..... N80-21194 #
PB80-110299 ..... N80-20940 #
PB80-110307 ..... N80-20570 #
PB80-110323 ..... N80-20934 #
PB80-110364 ..... N80-21183 #
PB80-110398 ..... N80-20996 #
PB80-110406 ..... N80-20997 #
PB80-110869 ..... N80-20601 #

PB80-110885 ____ N80-20382 #
PB80-111016 ____ N80-20476 #
PB80-111032 ____ N80-20951 #
PB80-111362 ____ N80-20359 #
PB80-111420 ____ N80-20362 #
PB80-111438 ____ N80-20361 #
PB80-111453 ____ N80-21012 #
PB80-111479 ____ N80-20979 #
PB80-111503 ____ N80-21216 #
PB80-111677 ____ N80-20803 #
PB80-111842 ____ N80-20804 #
PB80-111941 ____ N80-20356 #
PB80-112014 ____ N80-20998 #
PB80-112048 ____ N80-21005 #
PB80-112055 ____ N80-21006 #
PB80-112113 ____ N80-20364 #
PB80-112162 ____ N80-20935 #
PB80-112170 ____ N80-21029 #
PB80-112204 ____ N80-21036 #
PB80-112337 ____ N80-20937 #
PB80-112394 ____ N80-20938 #
PB80-112758 ____ N80-20430 #
PB80-112766 ____ N80-20447 #
PB80-112782 ____ N80-21002 #
PB80-113061 ____ N80-20401 #
PB80-113277 ____ N80-20994 #
PB80-113301 ____ N80-20440 #
PB80-113400 ____ N80-20787 #
PB80-113624 ____ N80-20936 #
PB80-113657 ____ N80-20947 #
PB80-113715 ____ N80-20802 #
PB80-113749 ____ N80-20912 #
PB80-114226 ____ N80-20796 #
PB80-114549 ____ N80-20946 #
PB80-114705 ____ N80-20957 #
PB80-114747 ____ N80-21009 #
PB80-115298 ____ N80-21197 #
PB80-115826 ____ N80-20445 #
PB80-115891 ____ N80-20945 #
PB80-116007 ____ N80-20363 #
PB80-116056 ____ N80-20800 #
PB80-116114 ____ N80-20446 #
PB80-116221 ____ N80-20444 #
PB80-116898 ____ N80-21148 #
PB80-117948 ____ N80-20976 #
PB80-117989 ____ N80-20995 #
PB80-117997 ____ N80-20999 #
PB80-118193 ____ N80-20365 #
PB80-118359 ____ N80-21198 #
PB80-118383 ____ N80-21219 #
PB80-118425 ____ N80-21000 #
PB80-118532 ____ N80-21096 #
PB80-118581 ____ N80-21010 #
PB80-118615 ____ N80-20977 #
PB80-118763 ____ N80-20944 #
PB80-119431 ____ N80-20981 #
PB80-119464 ____ N80-20978 #
PB80-120694 ____ N80-20556 #
PB80-121130 ____ N80-21003 #
PB80-122401 ____ N80-21011 #
PB80-122724 ____ N80-20798 #
PB80-123011 ____ N80-20799 #
PB80-123029 ____ N80-20943 #
PB80-123578 ____ N80-20805 #
PB80-125255 ____ N80-21004 #
PB80-802259 ____ N80-20795 #
PB80-802499 ____ N80-20800 #
PB80-802531 ____ N80-20910 #
PB80-802739 ____ N80-21193 #
PB80-803158 ____ N80-21031 #
PB80-803265 ____ N80-20555 #
PB80-803273 ____ N80-20586 #
PB80-803612 ____ N80-20585 #
PB80-803729 ____ N80-20394 #

PETC/TR-79/1 ____ N80-20416 #
PETC/TR-79/3 ____ N80-20417 #

PMTC-TP-79-3(____ N80-20305 #

PNL-SA-7949 ____ N80-20903 #

PNL-TR-372 ____ N80-20390 #

PNL-2652 ____ N80-21131 #
PNL-2999-PT-1 ____ N80-21130 #
PNL-2999-PT-2 ____ N80-21130 #
PNL-3083 ____ N80-20928 #
PNL-3191 ____ N80-20904 #

POLY-M/AE-80-8 ____ N80-20339*#

PPI-1030-6 ____ N80-20909*#

PPPL-1582 ____ N80-21164 #

PR-2 ____ N80-20972 #
PR-3 ____ N80-20971 #
PR-37 ____ N80-20873 #

PTPT-79-15 ____ N80-20264 #

PUB-104 ____ N80-21214 #

PWRRC-TR-123 ____ N80-20556 #

QR-1 ____ N80-20906 #
QR-3 ____ N80-20423 #
QR-6 ____ N80-20897 #

QTPR-1 ____ N80-20507 #
QTPR-1 ____ N80-20872 #
QTPR-2 ____ N80-20414 #
QTPR-3 ____ N80-20316*#

QTR-8 ____ N80-20817*#

R-342 ____ N80-20447 #
R-348 ____ N80-20445 #
R-349 ____ N80-20444 #
R-840 ____ N80-20342 #
R-845 ____ N80-20464 #

RADC-TR-79-174 ____ N80-20321 #
RADC-TR-79-181 ____ N80-20493 #
RADC-TR-79-212 ____ N80-21008 #
RADC-TR-79-235 ____ N80-20491 #
RADC-TR-79-248 ____ N80-20490 #
RADC-TR-79-255 ____ N80-20489 #
RADC-TR-79-260 ____ N80-21192 #
RADC-TR-79-261 ____ N80-20470 #
RADC-TR-79-262 ____ N80-20465 #
RADC-TR-79-267 ____ N80-20460 #

RAND/R-2418-AF ____ N80-20469 #
RAND/R-2474-ONR ____ N80-20788 #

REPT-2 ____ N80-20594 #
REPT-9 ____ N80-20344 #
REPT-10 ____ N80-20343 #
REPT-11 ____ N80-20980 #
REPT-12 ____ N80-21107 #
REPT-15 ____ N80-21123 #
REPT-16 ____ N80-21124 #
REPT-35 ____ N80-20679 #
REPT-37 ____ N80-20714 #
REPT-73 ____ N80-20638 #
REPT-74 ____ N80-20674 #
REPT-77 ____ N80-20705 #
REPT-78-805-4-005 ____ N80-20876 #
REPT-79-12-02 ____ N80-21191 #
REPT-79SDR2324 ____ N80-20349 #
REPT-202 ____ N80-20786 #
REPT-290 ____ N80-20575*#
REPT-758 ____ N80-20271*#
REPT-1750-01-1-2024 ____ N80-20267 #
REPT-1842-EEG/EE/TN-TR-80-2 ____ N80-20252 #
REPT-2613-005-001 ____ N80-21209 #

RFP-2952 ____ N80-20309 #

RHO-BWI-C-54 ____ N80-20972 #
RHO-BWI-C-55 ____ N80-20971 #

RLD-8904 ____ N80-21218 #

RLO-1388-395 ____ N80-21111 #
RLO-2227-727-7 ____ N80-20927 #

RM-394 ____ N80-21088 #

RR-79-1 ____ N80-20498 #
RR-79-2 ____ N80-20499 #
RR-528 ____ N80-20442 #

R79-19 ____ N80-21084 #
R79AEG405 ____ N80-20405 #

SAMSO-TR-79-83 ____ N80-20257 #
SAMSO-TR-79-79 ____ N80-20256 #

SAN-0034-191-T1 ____ N80-21136 #
SAN-2189-T1 ____ N80-20876 #
SAN-12093-1 ____ N80-20929 #

SAND-78-1563 ____ N80-20993 #
SAND-78-2282 ____ N80-20875 #
SAND-79-0176 ____ N80-20322 #
SAND-79-0387C ____ N80-20508 #
SAND-79-0893 ____ N80-20550 #
SAND-79-1151 ____ N80-20874 #
SAND-79-1197C ____ N80-21132 #
SAND-79-1222 ____ N80-20632 #
SAND-79-1963C ____ N80-20552 #
SAND-79-1969 ____ N80-20423 #
SAND-79-2146C ____ N80-20891 #
SAND-79-7014 ____ N80-20896 #
SAND-79-7015 ____ N80-20888 #
SAND-79-8041 ____ N80-20373 #
SAND-79-8232 ____ N80-20377 #

SDSB-79/04 ____ N80-20945 #

SER-C/DISS-247-MITT-147 ____ N80-20974 #
SER-C/DISS-250-MITT-149 ____ N80-20975 #

SERI/PR-351-480 ____ N80-20892 #

SERI/SP-69-290 ____ N80-20883 #

SERI/TR-33-239-VOL-1 ____ N80-20427 #
SERI/TR-34-092 ____ N80-20893 #
SERI/TR-35-078-VOL-1 ____ N80-20882 #

SLAC-PUB-2409 ____ N80-21173 #
SLAC-PUB-2432 ____ N80-21176 #

SQUID-US-1-PU-VOL-1 ____ N80-20341 #

SRI-JSN-79-05 ____ N80-20307 #

SRL-6909-TR ____ N80-20623 #

SSD-79-175 ____ N80-20308 #

STK-103 ____ N80-20475 #

SU-SEL-79-029 ____ N80-21047 #

SU-SUIPR-799 ____ N80-21240*#
SU-SUIPR-802 ____ N80-21239*#
SU-SUIPR-804 ____ N80-21238*#

SUNYBUF/WREE-79/04 ____ N80-21013 #

TAEB-79-8 ____ N80-20941 #

TCRL-14 ____ N80-20277 #

TDWR/LP-21-1 ____ N80-21005 #
TDWR/LP-21-2 ____ N80-21006 #

TID-4500 ____ N80-20930 #

TL-635314 ____ N80-20401 #
TL-657253 ____ N80-21106 #

TM-37 ____ N80-21221 #
TM-38 ____ N80-20805 #
TM-75 ____ N80-20250*#

TN-1979-66 ____ N80-20473 #

TPSR-26 ____ N80-21108 #

TR-FR-DPG582 ____ N80-20500 #

TR-1 ____ N80-20966 #
TR-3 ____ N80-20391 #
TR-3 ____ N80-20871 #
TR-40 ____ N80-21090 #
TR-50 ____ N80-21089 #
TR-79-2-97 ____ N80-21078 #
TR-79-19 ____ N80-20595 #
TR-88 ____ N80-21048 #
TR-159-SER-2 ____ N80-21087 #
TR-176 ____ N80-21047 #
TR-190 ____ N80-20884 #
TR-192 ____ N80-21092 #
TR-193 ____ N80-20602 #
TR-194 ____ N80-21091 #

TR-755 ..... N80-21081 #
TR-762 ..... N80-21060 #
TR-763 ..... N80-21051 #
TR-766 ..... N80-21046 #
TR-834 ..... N80-21083 #
TR-0079-4475-01-03 ..... N80-20256 #
TR-0080-5950-01-2 ..... N80-20595 #
TR-1117-1-2 ..... N80-21219 #

TREE-1349 ..... N80-20603 #

TRS-79/5 ..... N80-21012 #

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